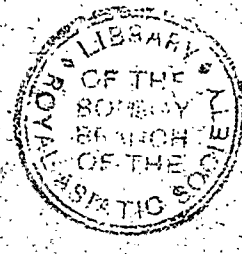
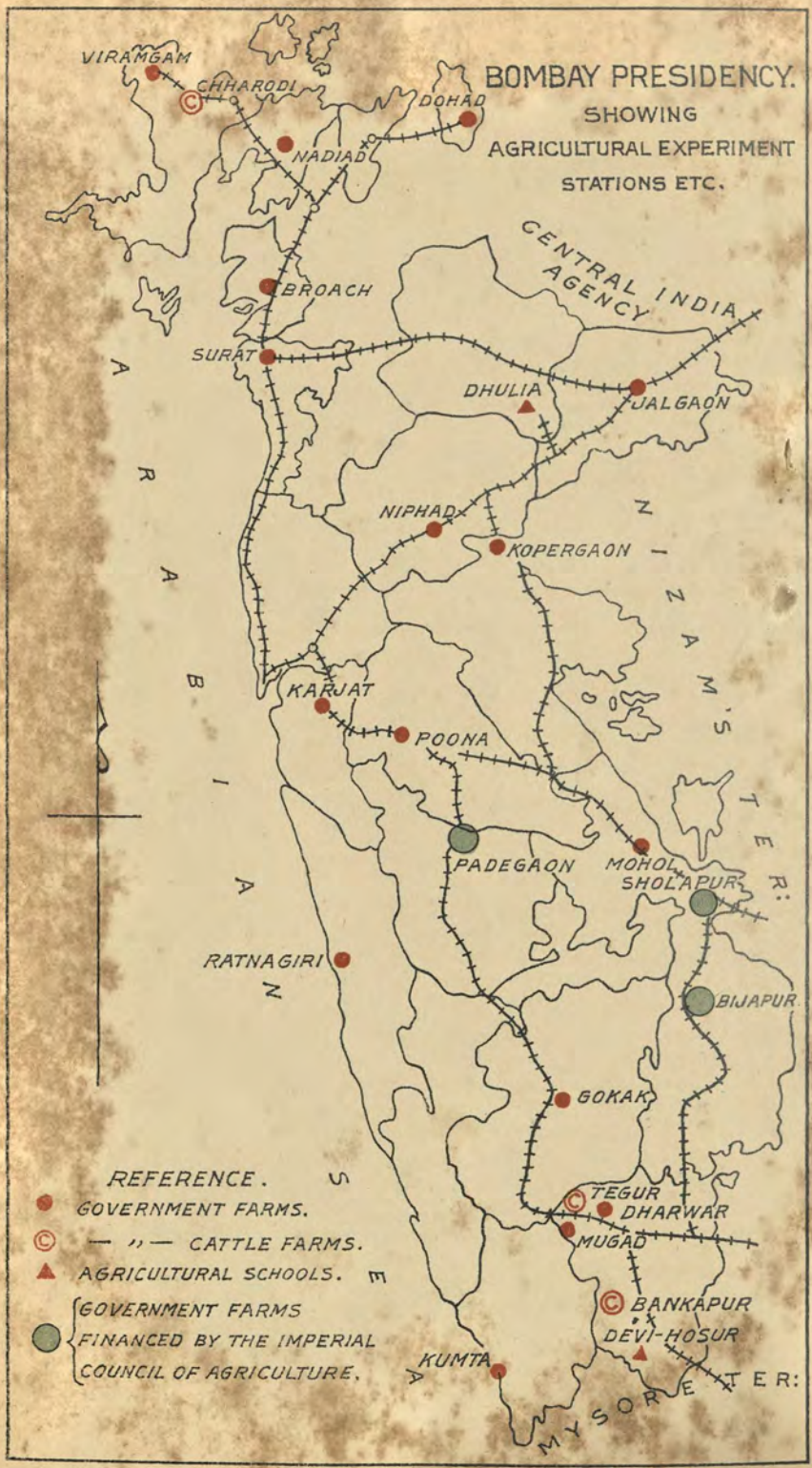
Annual Report of the Department of Agriculture in the Province of Bombay, 1936-37



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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, BOMBAY PROVINCE, 1936-37.

CHAPTER I.

FEATURES OF THE YEAR.

CLIMATE AND RAINFALL.

(1) The agricultural season of 1936–37 may, in general, be considered to have been fair over a large part of the Presidency. The rainfall received during the year was generally unevenly distributed, both as regards periodicity of fall and area and it was characterised by long breaks which had an adverse effect on agricultural operations and crops. In July and August, the rainfall was markedly deficient over almost all the Presidency and caused considerable anxiety in the early part of the season. A long period of dry climatic conditions prevailed at this time and failure of the kharif crops was imminent in parts of North Gujarat and in the eastern districts of the South Deccan and Karnatak. In other parts of the Presidency, the situation was not so acute but was by no means satisfactory. Very opportune and welcome rains in September alleviated considerably the position of the agriculturists, especially in the drought-affected tracts and the cultivators, who had endured the complete or partial failure of their *kharif* crops, became more hopeful of a good *rabi* cropping season. The dry conditions, which prevailed in October, somewhat falsified these hopes and a second acute situation ensued which, however, was somewhat relieved by substantial rainfall in the month of November. Owing to this uncertain condition of rainfall, combined with other adverse factors such as the prevalence of dry easterly winds, low temperatures and heavy attack of insect pests and plant diseases in many tracts, the yields of crops were considerably reduced in a number of districts in which "scarcity" conditions prevailed, necessitating measures for the relief of the agriculturists. Accordingly, the season under review may be characterised as disappointing over large tracts of the Presidency and it was only the rainfall received in September and November which saved many districts from

almost complete failure of crops. The prolonged and unfortunate breaks in the rains resulted in considerable scarcity of fodder, grazing and drinking water in numerous centres in the North Gujarat, East Deccan and East Karnatak districts, which suffered most from the insufficient and unevenly distributed precipitation. There was considerable migration of cattle from these tracts to more favoured localities and numerous cattle were disposed of at low prices by the cultivators who were unable to maintain them.

Crop Statistics, etc.

(2) The tabulated statement, given hereunder, compares the actual acreage sown under food-grain crops in the different Divisions of the Presidency and the estimated tonnage outturn during the year, under report, i.e. 1936–37 and the previous year, i.e. 1935–36 :—

Division.	Area in thousands of acres.		Estimated outturn in thousands of tons.	
	1935–36.	1936–37.	1935–36.	1936–37.
	Acres.	Acres.	Tons.	Tons.
Gujarat	2,466	2,126	758	485
Deccan	11,121	11,219	2,070	1,805
Karnatak	4,657	4,995	831	780
Konkan	1,603	1,605	656	605
Total for Bombay Presidency ..	19,847	19,945	4,315	3,675

The unsatisfactory nature of the season is clearly reflected in the considerable drop in estimated outturn, shown in the above-noted table, in spite of a slight increase in the total area sown. The average outturn of grain crops per acre was considerably lower than in the previous year and this decrease is attributable to the irregular and scanty rainfall which occurred over large tracts of the Presidency.

(3) Taking all crops together, there has been little alteration in the total area sown during the past five years, including the year under report, i.e. 1936–37. The areas under food grains and groundnuts have remained almost stationary, while the area sown with cotton in 1936–37 has decreased compared with

the previous year, due to the inadequacy of rains at the time of sowing :—

Year.	Area (in thousands of acres) sown with different crops in the Bombay Presidency.			
	Food-grain crops, i.e. cereals and pulses.	Cotton.	Groundnut.	All crops.
	Acres.	Acres.	Acres.	Acres.
1932–33	19,702	3,879	1,195	29,155
1933–34	19,792	3,655	1,292	29,181
1934–35	20,149	3,657	682	29,039
1935–36	19,847	4,163	891	29,373
1936–37	19,945	3,714	987	29,171

(4) Although the depression in the prices of agricultural produce, which became accentuated in 1930–31, still persisted during the year under report, slight signs of improvement were visible, both in food and cash crops, in most important centres of the Presidency. This welcome tendency is illustrated in the subjoined statement.

Prices prevailing at harvest time for agricultural produce (in seers of 80 tolas per rupee), except for cotton, which are recorded in rupees per khandi of 784 lbs.

Year.	Food crops.			Export crops.		
	Jowar (Sholapur).	Bajri (Nasik).	Rice (Thana).	Wheat (Ahmedabad).	Broach cotton (Bombay).	Groundnut (Karad).
	Seers.	Seers.	Seers.	Seers.	Rs.	Seers.
1932–33 ..	21	12	9	9	199	10
1933–34 ..	20	12	9	11	207	17
1934–35 ..	15	11	9	11	261	18
1935–36 ..	21	13	8	8	207	13
1936–37 ..	16	11	7	7	234	10

(5) The actual fluctuations in cotton prices can be seen from the following statement which gives the prices in rupees per khandi (784 lbs.) of Broach cotton at Bombay during the year under report. The prices from February to June, when the cultivators generally dispose of their crops, were the highest during the year :—

Month 1936.	Price in rupees.	Month 1937.	Price in rupees.
August	228	January	213
September	217	February	233
October	215	March	246
November	208	April	243
December	208	May	236
		June	238
		July	215

Sugar Prices.

(6) As was done in last year's report, two statements giving the price of (*a*) Indian and Java sugar in Bombay from August 1936 to July 1937 and (*b*) the average *gul* rates for the months of March, April and May in Poona from 1931, are given below for purposes of comparison :—

Statement showing prices of sugar (Indian and Java) from August 1936 to July 1937.

Month.	Prices of sugar at Bombay per cwt.	
	Indian.	Java.
1936	Rs. a. p.	Rs. a. p.
August	11 0 11	13 8 10
September	11 2 1	13 7 6
October	10 15 8	13 8 10
November	10 8 5	13 8 0
December	10 0 9	13 4 7
1937		
January	9 13 3	13 1 0
February	9 3 10	12 15 6
March	9 7 2	13 0 0
April	9 4 7	13 2 0
May	8 14 9	14 0 0
June	8 11 3	15 0 0
July	8 12 4	No quotations.

Statement giving average gul rates for the months of March, April and May in Poona from 1931.

Year.	Price of gul per palla of 250 lbs.	Area of cane in the Deccan.
	Rs.	Acres.
1931	15·66	40,238
1932	15·33	42,389
1933	10·79	45,592
1934	14·06	43,418
1935	18·59	47,832
1936	12·00	54,760
1937	10·75	53,023

The reduction in the prices of gul is due to the very large increase in the sugarcane acreage in the United Provinces, Hyderabad, Deccan and Mysore State which reduced very considerably the demand for Deccan gul in Kathiawar, Berar, Khandesh, Gujarat and the Nizam's Dominions, which were formerly important markets. It is anticipated that, as a result, the sugarcane acreage in the Deccan will be reduced in the next year.

Summary of Main Features of the work of the Agricultural Department during the Year.

(7) *District activities.*—During the year under report, the district activities of the Agricultural Department in connection with demonstration and propaganda, seed distribution, land improvement, crop protection, etc., continued to develop in almost every district of the Presidency. A notable feature of this work was the increased interest taken by the cultivators in land improvement schemes whereby, by simple but scientific methods of bunding and the construction of field embankments, cultivated lands are protected from permanent damage and loss by soil erosion. In Nasik District, an area of 3,250 acres was protected in this way and in the South Central Division, over 70 minor bunding projects were framed and carried out with the assistance of the staff of the Department, involving 1,804 acres of land. Similar work made rapid progress in certain Karnatak districts. The extension of

improved varieties of crops in the districts is another aspect of departmental activity which is increasing very rapidly year by year. In Khandesh, the newly evolved "Jarila" cotton has proved most successful in the districts as it fulfils a long-felt want in providing the cotton-growers with a wilt-resistant stapled cotton with as good an outturn and ginning percentage as the inferior *deshi* varieties. A seed multiplication and extension scheme was recently sanctioned by the Indian Central Cotton Committee for the increased expansion of the area under "Jarila" cotton. In the Southern Division, the areas under Jayawant and Gadag No. 1 cottons have reached 3 lakhs and 1 lakh acres, respectively, and the system of auction sales of kapas, which has been introduced and extended, is facilitating the preservation of pure seed and ensuring better prices for the growers. In Gujarat, 1027, A.L.F. and B.D. 8 cottons continued to be distributed widely by the Department but, in this tract in particular, future developments must depend on the improvement of the marketing organisation in order to ensure an adequate premium to the growers of cottons with superior spinning qualities. Among other crops, noteworthy progress was made in the extension of improved strains of paddy in the Southern Division where 24,386 acres of high-yielding rice varieties, evolved at the Mugad and Kumpta farms, were grown in Dharwar, Belgaum and Kanara districts. In Khandesh and Nasik districts, the area under improved wheat varieties increased from 4,000 to 15,000 acres and conspicuous success has attended the introduction of the improved wheat variety, Bansipalli 808 in Ahmednagar district and the Southern Division and of the improved mid-late rice strain K-540 in Ratnagiri district. Further details of the extension of improved varieties of crops are given in this Report and in its appendices. The shortage of rainfall, which prevailed over large areas of the Presidency during the year under report, has focussed attention on the work which is being done to evolve suitable "dry farming" methods of cultivation at Sholapur and Bijapur. These methods were fully tested at Mohol Farm where the "dry farming" methods resulted in an average outturn of 367 lbs. grain and 1,088 lbs. fodder from a jowar area of 43 acres. The maximum yields obtained from the "dry farming" plots were 1,017 lbs. grain and 2,080 lbs. fodder per acre. At Sholapur and Bijapur, the application of the results of the dry farming research work to ordinary cultivation increased yields of grain and fodder up to approximately 150 per cent. over the local cultivators' outturns. The organization of gun-clubs for the protection of cultivators'

crops from damage by wild animals made great progress, especially in the Southern Division where over 85,000 acres of crops were protected by these organizations. In Kanara district, 3,516 acres of betel nut palms were sprayed with Bordeaux mixture as a precaution against *koleroga* disease. The estimated benefit to the gardeners is Rs. 35 per acre. The district staff of the Department has recently been concentrating upon the improvement of village manure supplies by the introduction of better methods of conservation and of compost manufacture. This work has now been taken up by the public in several areas. In connection with livestock, the Cattle Conference held at Simla early in 1937, was of outstanding importance and the formation of a Presidency Livestock Improvement Association is under consideration. On the marketing side, grade specifications for grapes, tobacco, hides and skins and oranges were notified during the year and an experimental scheme for the grading of Nasik grapes was started under the supervision of an expert grader lent by the Agricultural Marketing Adviser to the Government of India.

(8) *Research activities.*—In the course of his scientific investigations into the problems of wilt resistance in cotton, the Plant Pathologist to Government has obtained almost wilt-immune strains in Kumpta, B.D. 8 and Million Dollar cotton varieties. Very valuable results were also obtained in research work on wilt immunity in sann hemp and Lathyrus sativus. Definite control measures have been worked out for the diseases of tobacco seed-beds in Kaira district. The practical results obtained at the Dry Farming Research Station, Sholapur, are mentioned above and are given in detail in paragraphs 15–21 of this Report. At the Sugarcane Research Station, Padegaon, the work of soil classification is now almost completed and it was warmly appreciated by the eminent Soil Physicist, Sir John Russell, when he visited the Station. The Imperial Council of Agricultural Research has sanctioned the extension of the scheme for a further period of three years. At the Poona Agricultural College and on practically all the Government Farms in the Presidency, much experimental work on the cultivation, agronomy and manuring of various crops was carried out and successful results obtained over a number of years were tested in the districts and incorporated in the propaganda work of the district staff. A successful beginning has been made with the development of irrigation farming in Kolaba district on the tail-waters of the Tata Hydro-electric Project at Khopoli where an experimental pumping plant was erected from funds provided from village uplift grants.

CHAPTER II.

AGRICULTURAL RESEARCH AND INVESTIGATION.

"*The basis of all agricultural progress is experiment.*"

(Report of Royal Commission on Agriculture in India.)

(9) *Introduction.*—Scientific research work towards the improvement of the materials and methods of agriculture and in the direction of the solution of agricultural problems forms one of the most important activities of the Department of Agriculture in the Bombay Presidency. This work is carried on at numerous Government research stations and experimental farms throughout the Presidency (see frontispiece map) and at the Poona Agricultural College. About 30 per cent. of the total annual budget grants of the Department are devoted to scientific research and, in addition, financial assistance has been made available to approved schemes of investigation by such bodies as the Imperial Council of Agricultural Research, the Indian Central Cotton Committee and the Sir Sassoon David Trust Fund. Details of such subventions, received during the year under report, are given in paragraph 98 of this Report.

(10) This Annual Report can only contain a very brief summary of the progress made in the various items of scientific research work carried out by the Department of Agriculture during the year. The first section of this chapter deals with major fundamental research schemes, largely devoted to soil and irrigation problems, which are in progress at Padegaon, under the Bombay-Deccan Sugarcane Research Scheme and at Sholapur and Bijapur under the Bombay Dry Farming Research Scheme. These two schemes, one in the irrigated tracts and the other in the "scarcity" areas, are of basic importance to very divergent types of agriculture and are definitely of the nature of fundamental scientific investigation into major soil and irrigation problems. Subsequent sections deal briefly with scientific work on crop improvement, either by botanical research or by control of insect pests and plant diseases, live-stock research work, economic problems of agriculture and, finally, miscellaneous items of scientific investigation, e.g., cold storage research work, agricultural engineering, etc.

Section I.

Soil and Irrigation Research.

A. *The Bombay-Deccan Sugarcane Research Scheme, Padegaon.*

(11) The year under report was the fifth year since the commencement of the Scheme which is financed jointly by the local Government and the Imperial Council of Agricultural Research. The work, which is directed towards investigation of fundamental soil and irrigation problems in relation to sugarcane cultivation in the Bombay Deccan, is divided into three sections, viz. soil physics, crop physiology and agricultural management.

(12) (*a*) *Soil Physics Section.*—In connection with the genetic soil survey, important problems bearing on the application of soil classification to practical agriculture were investigated on the Pravara Canals. These investigations have established the inter-genetic relationships of several important soil types and have brought to light certain conditions predisposing towards the development of mature soil profiles. A new type of survey, to ascertain the extent, origin and nature of degraded soils, has been undertaken on different canal areas. The experimental work, started in 1933, to study the effects of various factors on the different soil types, has given definite indications as regards changes in the colloidal complex under different treatments. Biological studies, to ascertain the extent of soil deterioration and soil improvement due to continuous cropping and following, are in progress and promise results of great practical importance to cane-growers. Base exchange studies on the so-called *chopan* soil (one of the degraded soil types), have shed considerable light on the probable behaviour of similar soils under perennial irrigation and have indicated that the current view-point that such soils are likely to be spoilt by cane cultivation requires to be modified. On the contrary, considerable soil improvement has resulted in this soil by judicious irrigation, manuring and cropping, without any rise in the level of the sub-soil water table. The bacteriological work, which has been completed, has given data of fundamental practical importance which indicate that the practice of farmyard manuring, irrespective of the soil types to which the manure is applied, is risky and may indeed actually result in soil deterioration under cane cultivation.

(13) (*b*) *Crop Physiology Section.*—Further research work in bioclimatics has shown a high correlation of the velocity of germination with the minimum temperatures which is found even to mask the effect of chemical constituents in the planted material. As regards growth, while humidity has been found to be the controlling factor, velocity of germination, proximity of sub-soil water-table and judicious manuring have been investigated in their ameliorative effects towards mitigating the adverse nature of defective humidity during the growing period. A point of great practical importance to cane-growers has been investigated in research work on manurial or cultural treatments which will check the ravages of stem-borer on the cane crop. During the year under report, experiments on the water requirements of the cane crop were modified to include investigations on the influence of the sub-soil water table and of combinations of water and manure on cane growth. This work has yielded a clear differentiation between the periods of response of the crop to water and to manure. Improved methods of the distribution of manurial top-dressings to cane have been continued and the optimum manurial requirements of the crop are being elucidated. Scientific investigation of the mechanism of absorption of mineral nutrients by the plant was continued and nitrogen has been shown to have a predominant influence in the absorption of other mineral constituents which are found to be available in the soil in sufficient quantities to balance heavy applications of nitrogenous fertilisers. Work has been done on the factors causing deterioration in the colour of gul. Finally, studies in germination have demonstrated the existence of two distinct currents of food materials, one directed to the root zone of the internode immediately above the node and the other from the lower internode to the bud.

(14) (*c*) *Agricultural Management Section.*—As an outcome of the results of research work in the Crop Physiology Section, which have thrown new light on the water and manure requirements of the cane crop, experiments on manuring and irrigation were completely changed and redesigned from the year under report. Work is now being directed towards comparisons between (1) varying quantities of nitrogenous top-dressings of 150, 225 and 300 lbs. N., (2) different periods of application and (3) different combinations of top-dressings at different periods. In irrigational experiments, the water applications of 95 and 130 acre inches were studied in combination with 225 and 300 lbs. N. in nitrogenous top-dressings. In almost

all the experiments, the cane varieties Pundia and P.O.J. 2878 were used. It is still too early to draw any definite conclusions but there are already indications of valuable practical results. The application of superphosphate to the cane crop has given good results this year and is being adopted in further irrigational and manurial experiments. Work on comparative applications of different quantities of phosphate in bonemeal and in superphosphate has not yet yielded conclusive results. With regard to work on different cane varieties, among canes planted in January, Co. 419, Co. 413, Co. 421 and Co. 426 gave higher yields than P.O.J. 2878, E.K. 28 and Pundia. With the October planted crop, Co. 419, Co. 413, Co. 407 and Co. 408 have shown similar results to last year. Subsidiary work on the cotton crop has indicated no advantage in yield from increased numbers of irrigations, especially during the flowering period, and Banilla variety has been found superior in outturn to Co. 2 and Gadag No. 1. Early cotton planting, i.e., in late April, resulted in better yields than May sowings.

B. *The Bombay Dry Farming Research Scheme, Sholapur.*

(15) The year under report was characterised by considerable shortage of rain, both at the main research station at Sholapur and at the Bijapur sub-station, where the rainfall received was 14·91″ and 13·24″, respectively, i.e., about 55 and 60 per cent. of normal.

(16) *Soil investigations.*—Physico-chemical studies of the soil types have revealed their highly colloidal nature, both of the deep soil types at Sholapur and of the three soil types under study at Bijapur.

Further observations on the rate of disintegration of *murum* at Sholapur have indicated the great possibilities of improving the highly-eroded, light, shallow soil—which covers extensive areas in the famine tracts of the Bombay Deccan—by proper methods of cultivation and measures for the conservation of rainfall and silt. Experiments on the loss of rainwater by surface run-off showed that, at Sholapur, nearly 2 inches of a limited total fall of 14·91 inches was lost by surface run-off from a plot cultivated with *rabi* jowar. At Bijapur, the loss was 1·6 inches out of 13·24 inches on a similarly cropped field. The quantities of silt carried away in the run-off water was 4·3 tons and 7·4 tons per acre at Sholapur and Bijapur, respectively.

(17) *Physiological studies of the jowar plant.*—The results of experiments on the water requirements of the jowar plant

confirmed the main findings of the previous year that the addition of farmyard manure, or of complete artificial fertilizer dressings, results in economy in the use of water. In addition, the wilting co-efficients of jowar plants, i.e., the percentage of soil moisture when the plants commence to wilt, root studies, etc., are in progress and are likely to lead to important practical results.

(18) *Agronomic work.*—Replicated plot experiments with the jowar crop have shown that, during a year of great shortage of rainfall, the adoption of the under-noted treatments resulted in considerably higher crop outturns :—

(*a*) ploughing the land resulted in 48 per cent. more yield of grain than from the crop on unploughed fields,

(*b*) the use of the "scooper", i.e., an implement designed to make shallow pockets or "scoops" in the loose surface soil of the field—and thus check excessive run-off of rainwater—gave 70 per cent. more grain yield than from unscooped lands,

(*c*) the adoption of a clean fallow-jowar rotation, whereby jowar is grown only every alternate year, was most effective in giving higher yields of both grain and straw. The increase was over 100 per cent. in comparison with the local cultivators' methods,

(*d*) on light, shallow soils, the cultivation of a crop of *sann* hemp and its burying, as a green manure crop in mid-August, resulted in doubling the yield of grain in the succeeding jowar crop as compared to the unmanured control area,

(*e*) on light soils, the use of the "scooper" gave greater outturn of grain by 27 per cent. in comparison with the "unscooped" fields.

(19) At Bijapur, similar results were obtained by the adoption of dry farming methods of cultivation. For instance, "scooping" proved effective on the deep black soils and gave almost double the yield of jowar grain and straw in comparison with control plots. The addition of farmyard manure at the rate of five cart-loads per acre resulted in very considerably increased yields of grain on both the deep black and the limey soil types. This increase varied from 77 to 101 per cent. on deep soils and 49 to 188 per cent. on limey soils. Harrowing in the farmyard manure was more effective than ploughing it in. At Bijapur, green manuring with *sann* resulted in increasing grain yields by 82 and 137 per cent. on deep black and limey soils, respectively. Similar results to those obtained at Sholapur were got from the adoption of a clean fallow-jowar rotation.

(20) Under the conditions of precarious and badly distributed rainfall, which prevailed during the year under report, the local cultivators' methods of cultivation gave very low yields, viz., 43 lbs. of grain and 156 lbs. of straw per acre at Sholapur. The Bombay Dry Farming Method, on the other hand, which includes treatments of bunding, ploughing, harrowing, wider-sowing and inter-cultivation, gave 100 lbs. grain and 366 lbs. straw per acre over an area of 24 acres. At Bijapur, the yields by the local method were 204 lbs. grain and 422 lbs. straw per acre, while the improved system of cultivation yielded 490 lbs. of grain and 711 lbs. straw per acre.

(21) These figures testify very eloquently to the important practical aspect of this research work and indicate how considerably the adoption of simple, unexpensive, improvements in cultural methods can benefit the cultivators in the areas liable to scarcity of rainfall in the Bombay-Deccan.

Section II.

The Improvement of Crops.

A. Cotton.

(*a*) *Gujarat.*—The work of cotton improvement in the Gujerat Division is centred at Surat, Broach and Viramgaon, at all of which places; scientific botanical research work is in progress towards the production of improved strains of cotton which will give higher returns per acre to the cotton-growers.

(22) *Botanical work on cotton improvement at Surat.*—At Surat, work is being concentrated on the production of a strain of improved Surat cotton which will possess the high spinning qualities of the improved 1027 A.L.F. variety, already introduced and extended by the Agricultural Department, and, which, at the same time, will give a higher ginning percentage similar to other improved strains of Surat cottons. Selections have been obtained which give a higher ginning percentage by 3·4 per cent. than 1027 A.L.F. but which are somewhat shorter in staple length than that variety. During the year under report, a number of fresh crosses have been made which aim at combining the desired characters and there are indications that the solution of this important problem is more likely to be obtained by such hybridization work than by any further selection among the existing Surat cottons. This problem of the conflict between staple length and ginning percentage is

common in all the cotton-growing tracts of the Presidency where improved varieties of cotton have been, or are being, introduced and a satisfactory solution is a matter of vital importance to the welfare of the cotton-growers.

(23) *Broach Cotton Breeding Scheme.*—At Broach, the cotton-breeding work is being financed by the Indian Central Cotton Committee and the year under report was the fifth year of the Scheme. The work has for its object the breeding of suitable types of cotton for the Nerbudda-Mahi zone which will be wilt-resistant, heavy-yielding, high-ginning and which may replace the inferior local mixture, consisting largely of Goghari. The Cotton Breeder has continued his selection work among local Broach cottons and his two new selections, viz., N.S. 12 and N.S. 49, show considerable promise. N.S. 12 was tested in replicated plots with B.D. 8, the improved variety now being distributed in Broach district by the Agricultural Department and it was found to give considerably higher outturns per acre. B.D. 8 appeared to be adversely affected by the unfavourable seasonal conditions which prevailed during the season. At this centre, hybridization work is also in progress and two crosses, viz., B.D. 8 × G.A. 26 and B.D. 8 × (B.D. 8 × G.A. 26), were grown on a fairly large scale during the year under report. Segregates have been obtained from both these crosses which are more satisfactory than the original parent material and are being retained for further study. Segregate 6 has given a ginning percentage of 36·9 with a fibre length of 22·0 mm. and showed no signs of wilt in the field. The replacement of the local mixture by such a cotton in the Nerbudda-Mahi zone would add lakhs of rupees to the profits of the cultivators.

(24) *Botanical work on cotton improvement at Viramgaon.*—The object of this research is to obtain types of Wagad cotton which will be definitely superior to the local varieties in spinning value and which will also give higher ginning percentages and higher yields per acre. Two promising segregates from the cross Wagad 8 × 1027 A.L.F. were tested in comparative yield trials but significant results were not obtained. Further trials are being continued. The Indian Central Cotton Committee has undertaken to finance a research scheme for the improvement of Dholleras-Wagad cotton at Viramgaon and work will be started in the current year.

(*b*) *Khandesh.*—Cotton improvement work in Khandesh is financed by the Indian Central Cotton Committee and is carried out at the Government Farm, Jalgaon. The main

object is to obtain, by unit selection, or by hybridization, suitable wilt resistant types of Khandesh cottons with high-yielding, high-ginning and good spinning qualities to replace the local Banilla or N.R. varieties.

(25) *Khandesh Cotton Breeding Scheme.*—The three promising strains of Neglectum Verum, viz., N.V. 57-7, N.V. 56-3 and N.V. 56-17, referred to in last year's report, were compared for yield on replicated plots for the third year. These trials were also conducted on Bhadgaon and Dhulia Farms. N.V. 56-3 gave significantly higher yields than the other two strains and than the local varieties, e.g., N.R. 6 and Banilla. In district trials on cultivators' fields, the same strain, i.e., N.V. 56-3, proved, in general, superior and has gained a good reputation among the cultivators. This strain, which has been named "Jarila", was also satisfactory in spinning tests at the Technological Laboratory, Matunga, and at local mills and the seed is now being multiplied up for distribution in the districts. In this work, financial assistance has been made available by the Indian Central Cotton Committee for one year in the first instance. "Jarila" cotton, grown at Jalgaon Farm, fetched a premium of Rs. 28 per khandy over the local variety in local sales. The Khandesh Cotton Breeding Scheme has been extended for a further period of five years from April 1937 and work on further isolation of desirable commercial strains with better yield and ginning percentage and greater wilt-resistance is in progress.

(*c*) *Southern Division.*—The work of botanical research on the cotton crops of the Southern Maratha Country is centred on the Government Farm, Dharwar.

(26) *Botanical work on cotton improvement at Dharwar.*—During the year under report, the strains of the Jayawant $\times 15$ cross, from which it is hoped to obtain a "New Jayawant" cotton which will be as good as the present Jayawant variety in spinning qualities but with a higher ginning percentage, were continued. As a result of a series of replicated plot tests, one strain, viz., Jayawant $\times$ 15 (11-0-1-4) proved superior to Jayawant in yield and ginning percentage and equally good as regards staple. These trials will now be extended in the districts. Other selections for high-ginning strains were continued. Work on wilt resistance in Kumpta cotton was also carried out at the Farm laboratory.

(*d*) *Miscellaneous.*

(27) *Cotton Wilt Breeding Scheme, Poona.*—As a complement to the cotton breeding schemes in Broach and Khandesh, scientific research work on the breeding of wilt resistant strains of cotton suitable for these two tracts is being undertaken at Poona under the direction of Dr. Uppal, Plant Pathologist to Government. This work is being financed by the Indian Central Cotton Committee.

(*a*) *Broach section.*—During the year under report, the seed from 14 healthy plants obtained from B.D. 8 cultures last year was tested separately and a fifty-day test under optimum conditions of infection, in which 12,338 individual plants were under observation, resulted in the retention of only 17 plants which were free from wilt symptoms and which have been transplanted in an infected plot for further study. Similar work was carried out with New Selection 12 and B.D. 8 crosses obtained from the Broach Cotton Breeding Station. 13,421 plants of N.S. 12 and 10,179 plants of B.D. 8 crosses were under observation and, as a result, a few promising selections have been retained, the progeny of which will be further tested in the glass houses next year.

(*b*) *Khandesh section.*—Trials for wilt resistance under optimum conditions of infection were continued with plants of the "Million Dollar" variety and with different strains of *Gossypium arboreum* var. *neglectum*, collected from different parts of India and from Burma. 131 plants of "Million Dollar" were found free from leaf mottle and have been retained for further investigation. All the Neglectum strains, except Chinese R. 1 Spotless, succumbed to wilt disease. 16 plants of the resistant strain have been transplanted in the infected bed. The important practical aspect of this work is the isolation of a highly wilt-resistant strain for hybridization with the best Neglectum verum strains obtained under the Khandesh Cotton Breeding Scheme at Jalgaon.

(*c*) *Surat section.*—The Indian Central Cotton Committee has recently sanctioned a similar scheme for the development of wilt-resistant strains in Surat cottons and work has been commenced with 1027 A.L.F. and other Surat types both at Poona and on a plot of land at Shera near Ankleshwar.

B. RICE.

(28) Botanical research work on the improvement of the rice crops of the Presidency is being carried on at the Rice Research Station, Karjat, under the Crop Botanist and at Mugad, Kumpta and Ratnagiri Farms under the Deputy Directors of Agriculture, Southern and South Central Divisions. Work on the botanical improvement of the rice crop in all the major rice-growing tracts of the Province is in force and, in many instances, higher yielding and better quality strains have already been evolved and their seed is being multiplied and distributed to the rice-growers.

During the year under report, rice-breeding work in the Southern Division was directed towards the testing of selected strains of Mugad and Antersal varieties at the Mugad rice-breeding station. These strains, seven in number, have proved definitely higher-yielding than the local varieties and are now being multiplied in cultivators' fields for seed distribution. At the Kumpta Farm, similar work on Muskaty, Jeddu, White and Red Halga and Mugin Bendu varieties is in progress.

At the Karjat Rice Breeding Station, selection work in numerous rice varieties, suitable for the Deccan and Konkan tracts, is being carried on and, in addition, hybridization, mainly with Kolumba strains, is in progress and promising cultures have been obtained.

At Kumpta Farm, a late Varangal strain No. 487 has given 11·48 per cent. more grain than the local rice variety and is being tested on a field scale at Chiplun.

C. WHEAT.

(29) The wheat-breeding work of the Agricultural Department is mainly carried out at the Cereal Breeding Station, Kundewadi, Niphad, under the Crop Botanist to Government, and is supplemented by trials on Government Farms and cultivators' fields in the districts where wheat-growing is practised. Further developments in the improvement of this crop are being hampered by lack of information regarding fundamental aspects of the problem of rust resistance in the different varieties under experimentation and proposals have been submitted to the Imperial Council of Agricultural Research for the establishment of a Rust Research Station

in the Province. During the year under report, progress was made with the testing of selections and crosses obtained from previous research work, notably in the Bansipalli and Khapli wheat varieties.

D. OTHER CEREALS.

(30) The scientific improvement of the bajri crop is being undertaken at Niphad to which centre this work has been transferred from Poona. Intensive in-breeding is in progress to obtain morphological purity as an initial stage for further botanical research work. At Mohol Farm in the South Central Division, four strains of Maldandi jowars were tested under dry-farming conditions and gave superior outturns in comparison with the local varieties. At other Government farms, work has now been largely confined to the testing of improved strains in replicated plot series as a preliminary to seed multiplication and distribution in the districts.

E. TOBACCO.

(31) Work at the Nadiad Tobacco Breeding Station, Gujarat, included selection to obtain a smaller and thicker leaf type for the Piliu tract and 20 cultures have been retained for further study. A considerable amount of research has been done on tobacco curing and comparative trials of flue versus sun curing methods were carried out with Harrison Special variety and with Gandiu No. 6. Much attention was given to the economics of different curing processes and to obtaining correct trade valuations of the products obtained.

F. OTHER CROPS.

(32) (*a*) *Linseed.*—The year under report was the third year of the Linseed Breeding Scheme, financed by the Sir Sassoon David Trust Fund and directed by the Economic Botanist to Government at Poona. Further selection work among the linseeds of the Province was carried out and 48 selections have been obtained, which show superiority in the important characters of yield, higher oil content and superior drying quality of oil. This material is being utilised for further work. Other linseed types from different tracts of India and from foreign countries are also under examination.

(33) (*b*) *Castor.*—Work on castor improvement is being conducted at Nadiad and one type S. 20 has been found which gives 13 per cent. higher yield than the local varieties and

which is, on that account, much appreciated by the cultivators in Kaira and Panch Mahals districts.

(34) (*c*) *Gram.*—At Dharwar, efforts are being continued to obtain wilt resistant strains of gram. One strain No. 18 was tested in replicated plots with local varieties and gave 481 lbs. gram per acre as compared with 115 lbs. per acre of these varieties. No. 18 strain showed only 1 per cent. wilted plants as compared with 74·4 per cent. in the local gram types. At Niphad, certain early-maturing strains of gram are most promising and have given much higher outturns than the local varieties.

(35) (*d*) *Nagli.*—The multiplication of the seed of improved nagli strains was continued at the Hatkhamba Station and the seed is now being distributed to cultivators.

(36) (*e*) *Sugarcane.*—At Kopergaon Farm, comparative yield trials of different sugarcane varieties were continued in addition to manurial and rotational experiments in cane cultivation. The work at this centre has been co-ordinated closely with the research work at the Sugarcane Research Station at Padegaon. At Gokak Farm in the Southern Division, sugarcane continued to receive major attention and the variety J213 appears to be most suitable for extension in this tract.

(37) (*f*) *Vegetable crops.*—With the financial assistance from the Sir Sassoon David Trust Fund, botanical work on the improvement of the chillie and brinjal crops was continued at Ganeshkhind Experimental Gardens under the Horticulturist to Government. Superior high-yielding strains of these important vegetable crops have been obtained.

(38) (*g*) *Grazing and fodder crops.*—The Cattle Conference, held at Simla in May, 1937, stressed the paramount importance of the improvement of grazing and fodder-growing in the interests of the development of better cattle. This work has been engaging the attention of the Department of Agriculture for a number of years and, during the year under report, experimental work on rotational grazing and pasture improvement was continued under the Economic Botanist to Government. The season was not favourable for grassland investigations owing to scarcity of rain and the difficulty of obtaining cattle for the work owing to their migration to more favoured areas. However, previous results on the advantages of rotational grazing were confirmed. A survey of a forest grass *kuran* at Satpur, Nasik district, was carried

out as a preliminary to rotational grazing experiments in this district in co-operation with the Forest Department. A five years' scheme for research work on the improvement of grass-lands was prepared, in co-operation with the Forest Department, approved by the Provincial Agricultural Research Committee and forwarded to the Imperial Council of Agricultural Research for consideration and finance.

Section III.

Livestock Research Work.

(39) (*a*) *Cattle.*—Research work on the improvement of cattle is being carried on at two Government cattle farms, viz., at Chharodi, for the Kankrej breed and at Bankapur, for the Amrit Mahal breed. Attention is being particularly given to breeding for early maturity and high productivity, combined with scientific investigations into the nutritive value etc., of different fodders and feeding stuffs. Herd registers of pure breeds in the Presidency are being maintained in the interests of the local breeders.

(40) (*b*) *Sheep.*—The Sheep Breeding Scheme at Bhamburda, Poona, has been sanctioned by the Imperial Council of Agricultural Research which body is financing this work. The necessary land has been taken over from the Forest Department and the foundation stock will be purchased at the end of the current year.

(41) (*c*) *Poultry.*—The Imperial Council of Agricultural Research have sanctioned a sum of Rs. 43,736—and the local Government a sum of Rs. 6,253—for research work in poultry-breeding for a period of five years from 1st October 1936. This scheme has been started at three centres in the Presidency, viz., Kirkee, Poona district, Vadala, Ahmednagar district and Ankleshwar, Broach and Panch Mahals district. The work at all centres is supervised by the Livestock Expert to Government. Pens of White Leghorn, Rhode Island Reds, Black Minorcas and Light Sussex poultry and of Indian Runner and Khaki Campbell ducks have been established as foundation stock for breeding experiments and, in addition, it is intended to add two indigenous breeds, viz., the Chittagong and Naked Neck to the stock. The selection of birds for breeding is being done on the basis of trap nesting records and feeding experiments are in progress. Special attention is being given to the design of a suitable cheap poultry house for use in the villages.

A scheme for the investigation of the incidence of poultry diseases in railway transit and for the improvement of methods of transport of poultry by rail has been prepared, in co-operation with the Veterinary Department, approved by the Provincial Agricultural Research Committee, and submitted to the Imperial Council of Agricultural Research.

Section IV.

MISCELLANEOUS RESEARCH WORK.

Cold Storage Research Scheme, Ganeshkhind.

(42) The Cold Storage Research Scheme, Ganeshkhind, is an all-India research scheme, financed by the Imperial Council of Agricultural Research. The work commenced in the year 1934 and, therefore, the year under report, i.e., 1936–37, was the third year of working.

Experimental work was continued on the effect of different types of wrappings on the keeping quality of mangoes in cold storage and the results indicate that such adherent wrappers are injurious and spoil the fruit. A well-ventilated crate is found to be most suitable for containing mangoes in cold storage.

Trials with Nagpur oranges and Malta oranges showed that these fruits can be kept in good condition at 40° F for three and four months, respectively.

Potato tubers for seed purposes were kept at 35° F for 10-11 months in good condition and without sprouting.

Preliminary cold storage trials on bananas from Madras, chikoos from Baroda and apples from the United Provinces were commenced. A scheme for investigation into the gas storage of fruits is being submitted to the Imperial Council of Agricultural Research.

Agricultural Engineering Research.

(43) *Defibration of cotton seed.*—This scheme for research work on the economic and technical aspects of defibration of cotton seed is financed by the Indian Central Cotton Committee and was started in 1935. During the year under report, the feeding arrangement of the DeSegundo defibrating machine was improved, resulting in a larger outturn and more economic working. However, the results obtained have not shown any

advantage in the process of defibration which would compensate for the additional time, labour and cost in carrying out this operation on a large scale and there is no demand from the cultivators for the process or for the products resulting therefrom. Accordingly, proposals have been made to terminate the work and dispose of the plant as soon as possible.

(44) *Research work on agricultural implements and machinery.*—During the year under report, further research work was continued on :—

(*a*) Seed drills for cotton, jowar and wheat,

(*b*) Winnowing fans,

(*c*) Ball-bearing cart wheels,

(*d*) Soil scooper,

(*e*) Groundnut diggers.

Light-weight cotton drills, designed by the Agricultural Engineer, were sent to Khandesh and the Southern Division for exhaustive trials on Government Farms. So far, the reports received on the working of these implements are satisfactory. Improvements have been made on the "all steel" drill under test at the Dry Farming Research Station, Sholapur. A considerable advance has been made in the design of a cheap winnowing fan, suitable for Indian conditions and it is anticipated that, as a result of district trials now in progress, it will be possible next season to place these implements in the hands of the cultivators.

With regard to ball-bearing wheels for bullock carts, it is recognised that their wide introduction is largely a matter of cost and work has been in progress to cut down their price and render them, as simple and inexpensive as possible. A cart at the Agricultural College Dairy has been fitted with these ball-bearing wheels, which show practically no signs of wear though in constant use during the past eighteen months. Demands for sets are now being received from the public who appreciate the advantage in reduced draught and general efficiency which result from their adoption. The soil "scooper", designed for work in the dry areas of Sholapur, was found unsuitable at Bijapur owing to different soil conditions. Certain modifications have been made and the implement is undergoing extensive trials. There is a considerable demand for an efficient groundnut digger from Satara District and from the Southern Division and the implement, designed

at the Agricultural Engineering Workshop, has been tested at several centres in these tracts. The cultivators greatly appreciated its performance in comparison with the local method of harvesting but further experimental work towards improvement is in progress.

Two small ridging implements, one of wood and the other of steel, have been designed for use in Gujarat.

Section V.

Further Research Schemes.

(45) During the year under report, the Imperial Council of Agricultural Research sanctioned three research schemes, as under, upon which work has not yet been started :—

(*a*) Virus Diseases of Plants Scheme (sanctioned for 5 years at a cost of Rs. 80,474).

(*b*) Sann-hemp Cultivation Scheme (sanctioned for 3 years at a cost of Rs. 3,660).

(*c*) Sheep-breeding Research Scheme (sanctioned for 5 years at a cost of Rs. 85,122 of which the Imperial Council of Agricultural Research has sanctioned Rs. 76,390).

In addition, the under-noted schemes have already been approved and sanctioned by the Imperial Council of Agricultural Research and await the necessary financial provision being made by that body before commencement :—

(*a*) Scheme for investigation into "Striga" attack on jowar (sanctioned for 5 years at a cost of Rs. 27,060, of which the Imperial Council of Agricultural Research has agreed to contribute Rs. 21,648).

(*b*) Scheme for research work on Goat Breeding (sanctioned for 10 years at a cost of Rs. 97,410, of which the Imperial Council of Agricultural Research will meet Rs. 86,070).

(*c*) Scheme for research work on Cytology of the Papaya (sanctioned for 3 years at a cost of Rs. 6,000).

The under-noted schemes, which were approved by the Provincial Agricultural Research Committee during the year under report, have been forwarded to the Imperial Council of Agricultural Research for consideration :—

(*a*) Scheme for research work on packing and grading of fruits (3 years—Rs. 22,632).

(*b*) Scheme for research work on Poultry Diseases (1½ years —Rs. 6,120).

(*c*) Scheme for Wool Analysis (submitted by Registrar, Bombay University) (3 years—Rs. 15,300).

(*d*) Scheme for research work on grassland improvement (10 years—Rs. 74,810).

(*e*) Scheme for research work on gas storage of fruits (2 years—Rs. 19,062).

(46) The Indian Central Cotton Committee, at its meeting in February, 1937, sanctioned research schemes for (*a*) Cotton Wilt Breeding at Poona, (*b*) Cotton Wilt Breeding at Surat and (*c*) Cotton Breeding Scheme (Dholleras-Wagad) Viramgaon at costs of (*a*) Rs. 42,350 (5 years), (*b*) Rs. 14,385 (5 years 7 months) and (*c*) Rs. 27,110 (5 years).

(47) The Sir Sassoon David Trust Fund Trustees have sanctioned a scheme for the study of the Betel Vine Bug (Rs. 3,140 for 4 years) but work has not yet commenced.

CHAPTER III.

AGRICULTURAL SERVICE AND PROPAGANDA.

"Agricultural research can be of no help to the cultivator until its results are given to him in a form in which they may become a part of his agricultural practice."

(Report of Royal Commission on Agriculture in India.)

(48) *Introduction.*—The success of scientific research work in agricultural investigations marks the solution of one problem but, at the same time, represents the creation of another. Unless such results can be widely explained and demonstrated in the districts and on the fields of the cultivators who will be benefited by their adoption, they must remain barren and unfruitful. For this reason, the value and importance of an adequate and efficient district organization, in touch, on one hand, with scientific workers and, on the other hand, with the agriculturists themselves, cannot be too strongly stressed and is essential to the successful working of any policy of agricultural development and improvement. The primary object of all agricultural propaganda is to induce and influence the unit cultivator by education, demonstration and example, to adopt improved agricultural methods and materials which, sooner or later, will result in increased profits. This work is an important function of Government but can be considerably accelerated and intensified by the assistance and co-operation of non-official agencies and individuals in the districts. In the Bombay Presidency, such non-official help in agricultural propaganda and extension work has contributed in no small degree to the improvement of agricultural practice in many tracts.

Section I.

Seed Supply.

(49) *Introduction.*—The Royal Commission on Agriculture commented upon the fact that, in India, the only agencies for the distribution of pure seed of improved varieties of crops are the Agricultural Departments and agencies, such as co-operative societies, working in co-operation with these Departments. This work has now developed to a very great extent in the Bombay Presidency and, with regard to cotton,

no fewer than six organised seed distribution schemes are in force with the financial assistance of the Indian Central Cotton Committee. The indifference of the average cultivator in matters of seed storage and preservation is one of the main obstacles to the more rapid extension of improved crops in general cultivation and results in an annual demand for fresh supplies of pure seed of improved crops which is many times greater than can be supplied by official agency. It is essential that steps should be taken to improve the technique and methods of seed storage in villages so that the cultivators themselves could take a more active part in meeting their own requirements for good seed, thus enabling the Agricultural Department to concentrate upon providing annually nuclei of pure seed stock for all crops to be multiplied on the lands of registered seed-growers. One reliable method of dealing with this problem is to be found in the extended organization of " Seed Supply Societies " on a co-operative basis which bodies would have their own seed-growers, supplied annually with pure seed from the Agricultural Department. So far, such organizations are mostly confined to cotton-growers but their extension to all types of crops is most desirable.

(50) *Seed Supply, Cotton.*—During the year under report, there were six organised seed distribution schemes for improved varieties of cotton in force in the Province. In all these schemes, financial assistance was given by the Indian Central Cotton Committee.

(*a*) *Surat Seed Distribution and Extension Scheme.*—This scheme deals with the distribution and extension of the improved cotton variety 1027 A.L.F. in Surat district. During the year, 2,643,064 lbs. of seed were handled by the Department, of which 1,556,409 lbs. were supplied to Rajpipla, Chota Udaipur and Idar States and 1,086,655 lbs. were distributed through 24 seed depots in the Surat district. In addition approximately 293,046 lbs. of 1027 A.L.F. seed were supplied directly by Co-operative Cotton Sale Societies, etc., to their members. The continued existence of a higher ginning, but inferior quality, cotton, viz., Surat 1A, in this district, where it is preferred by many cultivators, is affecting the extension of the 1027 A.L.F. variety and a revision of departmental cotton policy in Surat district is under consideration. The seed production area under departmental control and grown with pure 1027 A.L.F. was 25,582 acres.

(51) (*b*) *B.D. 8 Seed Distribution and Extension Scheme, Broach.*—This scheme is devoted to the distribution and

extension of the high-yielding and wilt resistant strain of improved cotton, i.e., B.D. 8 in Broach and Panch Mahals district. From a controlled area of 1,000 acres, 456,600 lbs. of seed were obtained, together with 615 bales of B.D. 8 lint. The latter were sold at a premium varying from Rs. 37 to Rs. 53 per khandy. About 200,000 lbs. of seed have been distributed over an area of 20,000 acres. Owing to uncontrolled and indiscriminate mixing of B.D. 8 with inferior local cotton, this improved variety failed to obtain an adequate premium, especially towards the end of the season. Attempts are now being made to market B.D. 8 pure under a departmental mark and guarantee so as to fetch higher prices to its growers.

(52) (*c*) *Revised Jayawant and Gadag No. 1 Seed Distribution and Extension Scheme, Southern Division.*—Work in connection with the distribution of Jayawant cotton seed was undertaken from seven centres which were latterly reduced to six as the Hubli Co-operative Cotton Sale Society did not accept the revised scheme as sanctioned by the Indian Central Cotton Committee and the local Government. The reserved area under pure Jayawant at six centres was 25,006 acres and 1,568,644 lbs. of seed were stocked, of which 862,643 lbs. were distributed by departmental agents. Gadag No. 1 seed was produced on 22,614 acres at two centres and 844,250 lbs. of pure seed were distributed. The total areas grown with Jayawant and Gadag No. 1 cottons during the year under report were about 3 lakhs and 1 lakh acres, respectively. The Hubli Co-operative Cotton Sale Society has now agreed to co-operate in the scheme and will organise multiplication and distribution of pure Jayawant cotton seed in the Hubli tract in co-operation with the Agricultural Department.

(53) (*d*) *Banilla Seed Distribution and Extension Scheme, Khandesh.*—This scheme, which had for its object the extension of Banilla cotton in Khandesh, terminated during the year under report as the Agricultural Department has decided, with the approval of the Indian Central Cotton Committee, to concentrate on the distribution of the improved strain N.V. 56-3, now known as "Jarila". This strain is superior to Banilla in staple, is much more wilt-resistant and is, in general, more suitable for the whole Khandesh tract. During the last year of the Banilla Scheme, 823,260 lbs. seed, sufficient for 32,930 acres, were distributed. The total estimated area under Banilla seed in Khandesh was 66,000 acres, of which 32,885 acres were under departmental seed and the remainder covered by natural spread.

(54) (*e*) *Banilla Seed Distribution and Extension Scheme, Deccan Canals.*—This is a combined multiplication and distribution scheme which aims at the extension of Banilla cotton in the areas irrigated by the Deccan Canals. During the year under report, 31 acres of pure Banilla cotton were grown at the Kopergaon Farm and 8,875 lbs. of pure Banilla seed were distributed to departmental registered seed-growers. Owing to insufficient rains, yields were poor. The working of this scheme during the past three years shows a net profit of Rs. 570.

(55) *Seed Supply, Other Crops.*—The multiplication and distribution of pure seed of improved varieties of all crops, other than cotton, is carried out solely by departmental agency, assisted, in some places, by co-operative organizations, e.g., Taluka Development Associations. The main features of this work during the year under report were the distribution of 295,000 sets of improved varieties of sugarcane at concession rates to cane-growers in the Deccan Canal tracts and of 10,000 lbs. of Kopergaon No. 1 improved groundnut seed in the same areas. In the South Central Division, 12,200 lbs. of seed of improved varieties of jowar, evolved at Mohol Farm, were distributed to the cultivators together with smaller quantities of improved nàgli seed, Akola bajri, etc. In the Southern Division, considerable quantities of seed of improved varieties of rice, wheat and groundnut were issued to cultivators by the officers of the Agricultural Department and through local Taluka Development Associations, etc. In Gujarat, in addition to the large departmental distribution of improved cotton seed, 25,000 lbs. of sann-hemp seed, 20,000 of the seed of the improved wheat variety No. 224 and 1,400 lbs. of *rabi* jowar No. 8 seed were distributed in the districts. In addition, 16,659 lbs. seed of the jowar variety Budh Perio No. 53 were supplied in 15 villages. In the North Central Division, much progress was made in the distribution of improved wheat seed, mainly of the varieties No. 224, No. 168, No. 808 (Bansipalli) and Pusa No. 4. This work is being carried out on organised lines with registered seed-growers who are supplied with pure seed for further multiplication. In all, approximately 3 lakhs pounds of improved wheat seed were distributed in this Division. Over 9,000 lbs. of Maldandi jowar seed were supplied to growers in Khandesh and, in the Thana district, large quantities of improved rice seed of Kolumba varieties were distributed to cultivators. In addition, the extension of cultivation of sugarcane, fodder crops, e.g., lucerne,

maize, nilwa jowar, etc., was assisted by the extensive distribution of sets and seed of improved varieties in many talukas. One notable feature of the year's work, especially in the coastal tracts, was the increased supply of fruit tree seedlings, pineapple suckers, mango grafts, etc., to cultivators from the Ratnagiri and Kumpta Farms.

Section II.

Livestock Work.

(56) *Introduction.*—During the year under report, continued interest in the improvement of livestock was evident throughout the Presidency. There is no doubt that His Excellency the Viceroy's Scheme of "gift bulls" for the grading up of cultivators' cattle has resulted in focussing public attention on this very important aspect of agricultural development and that the time is now ripe for the establishment of a Presidency organization, including both non-officials and officials, to maintain interest and guide future development in the direction of organised cattle improvement in all districts of the Presidency.

On the initiative of the Government of India, a Cattle Conference was held at Simla in May 1937, which was attended by the Provincial Ministers in charge of Agriculture, numerous officers of the Agricultural and Veterinary Departments in India and representative non-officials interested in livestock development. This Conference discussed fully the main aspects of future work on cattle improvement and laid down, in its resolutions, useful and practical suggestions for organised work in the future. In the Bombay Presidency, the response to His Excellency the Viceroy's scheme has been particularly gratifying and is a very strong indication of the widespread interest which exists in all districts in cattle improvement. The breeds of cattle in the Presidency are numerous and include many of the most important and valuable breeds in India. There are numerous non-official organizations devoted to the welfare of cattle and other livestock and, in many districts, skilled cattle-breeders and managers are to be found. The Presidency further possesses many undeveloped grazing areas and has great potentialities for the development of fodder growing and fodder storage on modern, scientific lines. With such natural advantages, the widespread organization of cattle improvement, in accordance with definite schemes of

development, must necessarily be productive of results of the greatest economic importance to the welfare of the cultivators.

(57) *Premium bulls.*—The rearing, selection and distribution of premium bulls in selected cattle-breeding tracts of the Presidency continued to be the major contribution of the Livestock Section of the Agricultural Department to cattle improvement in the Presidency. The following table shows the position of the " Premium Bull Scheme " in different divisions during the year under report :—

Division.	Number of bulls.
South Central	70
North Central	31*
Southern	66
Northern	80
Total ..	247

(58) *Livestock Improvement Act, 1933.*—The Livestock Improvement Act, 1933, which aims at the improvement of village cattle by the castration of all village bulls except such as are approved of for breeding purposes, was applied to four villages, Motebennur and Sidenur in Dharwar district and Shirsoli and Mhaswad in East Khandesh district. In the former tract, people are now appreciating the value of the Act in cattle improvement and 22 " scrub " bulls have been castrated. In East Khandesh, some difficulty has been experienced in the provision of good breeding stock to replace the 62 undesirable bulls which have been castrated. To begin with, it would appear to be desirable to concentrate the working of the Act in intensive cattle-breeding tracts and villages where pure cattle predominate and where effective results would be more rapidly and more obviously obtained.

(59) *Palghar Dairy District Scheme.*—The scheme is attracting considerable attention among dairymen and numerous applications for land have been received by the Livestock Expert to Government. Two areas of 500 and 537 acres, respectively

*The number of premium bulls in the North Central Division has been greatly reduced owing to the fact that 34 bulls, placed with Taluka Development Associations have been discontinued and fresh bulls have not been issued to these agencies as they were not found satisfactory for such work. 30 bulls and 16 cows were issued from Village Improvement Funds.

have already been allotted to approved applicants and efforts are being concentrated upon ensuring that these grantees work the conditions of the grant satisfactorily and so give a lead and an example to subsequent participants in the scheme. There can be no doubt as to the great importance of the establishment of such dairy enterprises outside Bombay, both on the purity and wholesomeness of the city's milk supply and on the health and efficiency of the dairy herds.

(60) *His Excellency the Viceroy's Gift Bull Scheme.*—At the Cattle Conference, held at Simla in May, 1937, it was reported that contributions from the public of the Bombay Province towards His Excellency the Viceroy's "Gift Bull" scheme amounted to approximately Rs. 61,000 out of a total of Rs. 1,25,000 for the whole of India. During the year under report, 90 bulls have been made available under the scheme by the livestock section of the Agricultural Department and stationed at suitable centres in the districts. Much difficulty has been found in obtaining suitable cultivators to maintain these "gift bulls" and methods for facilitating this work are under consideration.

(61) *Scheme for buffalo breeding and improvement.*—This work was started by the Agricultural Department as the result of an intensive inquiry in the buffalo breeding tracts of the Presidency which clearly indicated that considerable deterioration was taking place in the buffalo population and that the cultivators were getting lower returns from these dairy animals. The scheme provides for the testing of a large number of cultivators' buffaloes for milk and butter-fat yield over a period of time and for the selection of young male stock from the best milkers for rearing and subsequent issue for breeding purposes. In addition, instruction is given to buffalo owners as to the best methods of preparing and disposing of the produce of their animals. For the work under the scheme, thirty-six villages have been selected, seven in Kaira district of Gujarat, thirteen in Khandesh, six near Pandharpur in the Deccan and ten in Bijapur and Belgaum districts of the Southern Division. In all, 1,037 animals of the three main buffalo breeds of the Presidency have been tested and 52 good bull-calves have been obtained from high-yielding dams for rearing and issue for breeding purposes in order to grade up the local animals. This scheme was originally financed from rural uplift grants but is now carried on within the ordinary departmental budget grants of the livestock section.

(62) *Improvement of village poultry.*—A scheme for the improvement of village poultry by replacing country cocks by pure bred male stock was proposed by the Livestock Expert to Government and is being financed from rural uplift grants and departmentally. Already 710 cocks of White Leghorn, Rhode Island Red and Australorp breeds have been given out to villages and the organization of poultry improvement on a district basis is making good progress. In addition, premia were given to approved poultry farmers in the districts who are co-operating with the Livestock Expert in the work of poultry improvement.

(63) *Co-operative egg collecting, grading and marketing.*—It was realized that, concurrent with poultry improvement in the villages, the Agricultural Department must devote attention to the improvement of the marketing of poultry produce so as to ensure that the villagers get an adequate return for better produce. Accordingly, the Livestock Expert prepared a co-operative egg collecting, grading and marketing scheme which was in force during the year under report. This work was centred at Yellur in the Southern Division where the kamgar in charge graded and handled 34,775 eggs before despatching them to Poona and Bombay. Experience has shown that the development of the production of large-sized eggs over a considerable tract is an essential preliminary to the success of such work and that grading is essential in order to obtain better prices for the producers. As this scheme was considered premature in the present stage of the village poultry industry, it has been discontinued in the meantime.

(64) *Co-operation with Pinjrapoles, Gowshalas, etc., in cattle improvement.*—During the year under report, the Livestock Expert to Government continued to co-operate with the Bombay Gowrakshak Mandali, Kandivali, in the breeding of improved Gir cattle with the object of producing good male stock for distribution in the districts under His Excellency the Viceroy's " Gift Bull " scheme and as premium bulls. The Mandali has now got a good herd of pure Gir cattle of over 250 head and, during the year, five bulls were issued for breeding purposes. The Mandali gave valuable and timely assistance in the supply of fodder in the " scarcity " tracts of North Gujerat which was of the greatest assistance to the breeders of pure Kankrej cattle in that area. Proposals for the extension of co-operation between the Agricultural Department and Pinjrapoles, Gowshalas, etc., in the work of cattle improvement in the Presidency are under consideration.

Section III.

Crop Protection.

(a) *Against wild animals.*

(65) In last year's report, a full account was given of the work being undertaken by the Agricultural Department to protect the crops of the cultivators from damage by wild animals. This work is now largely a matter of the organization of "gun clubs" in villages, the members of which are organized in *shikar* parties to hunt and destroy wild animals such as pig, nilgai, etc., in the forest areas adjacent to their cultivated lands. In many districts, this activity has proved very successful and has enabled not only larger areas to come under cultivation but also less time and labour to be devoted to the arduous and unhealthy task of crop-watching by night.

(66) In the Southern Division, two more gun clubs were organized during the year, making a total of seventeen in all. 575 wild pigs were killed during the year and these cultivators' *shikar* organizations protected 85,000 acres of crops. Applications for assistance in the extension of this work are being received from many villages and the special Shikar Officer and his staff are fully employed in this work. Operations against wild deer were continued at Kaujageri and 140 animals were killed and 29,000 acres of crops protected at a cost of Rs. 304.

(67) In Khandesh, the "gun club" movement is making progress and, during the year under report, the organization at Salsingi, Bhusaval taluka, which comprises 10 villages, carried out 90 hunts and killed 106 pigs and 29 nilgai. It is estimated that this club saved Rs. 30,000 damage to crops at a cost of Rs. 600. Three new clubs have been organised and, in addition, the Raver Taluka Development Association maintains two *shikaries* for similar work in the interests of their members.

Similar work is making progress in the Poona, Satara and Ahmednagar districts of the South Central Division where the cane-growers, in particular, are taking an active interest in the crop protective measures advocated by the Agricultural Department. Assistance is being given in many districts by grants from rural uplift funds.

(*b*) *Against insect pests.*

(68) Work on the protection of crops against damage from insect pests comprises (*a*) research work, carried out under the direction of the Professor of Entomology, Agricultural College, Poona, and (*b*) district extension work for the introduction of approved control measures under the territorial Deputy Directors of Agriculture.

(69) *Research work.*—During the year under report, investigations were carried out on numerous important insect pests of crops, e.g., chillie thrips, pea and cabbage aphis, jassids, betelnut bug, citrus scale insects, etc. Control measures for many of these pests have now been obtained and are under trial on cultivators' fields in affected areas.

(70) *District work.*—It is always a difficult matter to organize cultivators for the protection of their crops against insect attack and it must be remembered that, unless such organization is complete, i.e., includes 100 per cent. of the cultivators, the work is very likely to be ineffective. Another practical difficulty in this connection is to obtain sufficient and timely warning of insect attack on crops so that control measures can be initiated and organized at a stage when they are most likely to be effective. A district organization for this purpose is most necessary.

(71) *Plant puller propaganda schemes, Broach and Surat.*—A notable instance of effective organization against a serious insect pest of crops is to be found in the above-noted schemes which aim at organizing the cotton-growers of Broach and Surat districts to remove the cotton stalks from their fields after harvest and so check the spread of boll-worm damage by preventing the carry-over of the pest from one season to another. This work is financed by the Indian Central Cotton Committee. Thousands of plant pullers have been distributed in the districts. In Broach, Amod and Wagra talukas, about 95 per cent. of the cotton area was up-rooted and, in the areas south of the Nerbudda, about 46 per cent. of the total cotton area has been cleaned after harvest. Work is now being concentrated in backward talukas with the ultimate object of 100 per cent. clearance in the Gujarat cotton growing tracts.

(*c*) *Against plant diseases and fungi.*

(72) Scientific research work on the protection of crops from damage by plant diseases and fungi is centred at the Poona Agricultural College under the direction of the Plant Pathologist to Government. In addition, however, to the fundamental research work conducted by this officer and

his staff, specific investigations into problems of plant pathology and mycology are conducted in certain centres of the districts where the attack of definite plant diseases and fungi on cultivated crops are of immediate economic importance to the local cultivators.

(73) During the year under report, the Plant Pathologist to Government was occupied in particular with investigations under the Cotton Wilt Breeding Scheme, financed by the Indian Central Cotton Committee, which aims at the evolution of wilt-resistant strains of cotton for the Gujarat and Khandesh districts. A brief resume of this work is given in paragraph 27 of this Report. In addition, he has succeeded in breeding a wilt-immune strain of sann-hemp, D-IX, the seed of which will now be multiplied up for distribution in the districts. The mode of inheritance of wilt resistance in sann is being studied.

(74) Among other important diseases, etc., of economic importance in the agriculture of the Presidency, the Plant Pathologist has obtained effective control measures for wilt in betel vine, powdery mildew of betel vine, and koleroga disease of betelnut palms. Other diseases under investigation at present are fig rust, fruit rot and twig blight of mango, black rot of custard apple, bacterial blight of soya bean, betel vine anthracnose, tobacco seed-bed diseases, and "Panama" disease of bananas. The Imperial Council of Agricultural Research has sanctioned a sum of Rs. 80,474 for a period of five years for scientific investigation into the virus diseases of crops in the Bombay Presidency and this fundamental and important research will shortly be started under the direction of the Plant Pathologist to Government.

As sanctioned by Government, a district research laboratory has been established at Sirsi in Kanara district for investigation into fundamental problems in connection with the *koleroga* disease of the betelnut palm.

A proposal has been submitted to the Imperial Council of Agricultural Research for the establishment of a station at Matheran in the Bombay Presidency for testing the rust reactions of different varieties of wheat in the Presidency.

(75) The Economic Botanist to Government continued during the year research work on striga on the jowar plant and the orobanche parasite of the tobacco crop. Work is being directed towards obtaining strains of jowar and tobaccoes, respectively, which will be resistant to these parasites.

(76) In the Southern Division, extensive propaganda work was undertaken to spread the practice of spraying with Bordeaux mixture as a control measure against *koleroga* disease on the betelnut palms. In Siddapur taluka, an area of 2,000 acres was sprayed as against 1,615 acres in the previous year, and loans, amounting to Rs. 9,492, were made to gardeners to meet the cost of spraying machines and chemicals and the wagers of expert climbers. This work was organised in 101 villages. Similar work, but on a less intensive scale, was carried out in other talukas of Kanara district. The total area sprayed was 3,516 acres—as against 3,156 acres last year—and the total saving to the garden-owners is estimated to be Rs. 1,23,060 at Rs. 35 per acre sprayed.

Section IV.

Publicity.

(77) The most important and effective publicity work of the Agricultural Department is carried out at cultivators' demonstrations and meetings in the districts which are held periodically in all tracts of the Presidency. During the year under report, the district officers of the Agricultural Department organized a very large number of such propaganda meetings, many of which were attended by prominent non-officials and the local officers of other Departments of Government. For instance, in the North-Central Division, 1,769 district demonstrations were held during the year and were attended by approximately 122,000 people. Similar activities were conducted in other Divisions, details of which will be found in the reports of the Deputy Directors of Agriculture concerned.

In addition, larger agricultural shows were organised at suitable centres, e.g., at Sholapur in January 1937—attendance 30,000 cultivators—at Kondanpur and Poona, at Bardoli and Jalalpore and at Ahmedabad. Members of the staff of the Agricultural Department contributed articles dealing with matters of local agricultural interest to numerous papers and periodicals in the districts.

Rural uplift vans in the South-Central Division, North-Central Division and Southern Division were equipped with materials for agricultural propaganda towards better farming methods in these tracts.

Section V.

Rural uplift.

(78) During the year under report, the Department of Agriculture continued to take a prominent part in the initiation, organization and supervision of schemes for rural uplift and village improvement in all parts of the Presidency. This work is being largely financed by grants from the Government of India, the bulk of which have been placed at the disposal of the Collectors of various districts in the Presidency.

(79) In the North-Central Division, the schemes proposed by the Agricultural Department in connection with rural uplift work were given in detail in Appendix C to last year's report together with the amounts allotted by the Village Improvement Committees in the districts. During the past year, considerable progress was made with these schemes, particularly in connection with the distribution of pure seed of improved crops, extension of fruit cultivation, development of cattle and poultry breeding in the villages and the protection of lands against soil erosion.

(80) In the South-Central Division, attention was mainly concentrated upon tree planting, improvement of village sanitation, preservation of farm-yard manure and the supply of improved seeds and agricultural implements. Many male poultry stock of improved breeds, e.g., White Leghorn, Rhode Island Red, were distributed in the villages and breeding bulls were purchased and maintained at suitable centres. The valuable work of the Deccan Agricultural Association in rural uplift at Khed Shivapur in Poona district is worthy of the highest commendation and illustrates fully the scope for useful work which non-officials can take in village improvement.

(81) In the Southern Maratha Country, the schemes for the distribution of improved paddy seed, the construction of Poona furnaces for gul-making, bunding operations and conservation of farm-yard manure in pits, were continued with success throughout the year. In addition, new items of work in connection with the extension of fruit and vegetable cultivation, improved methods of preparing farm-yard manure and supply of spraying machines to betelnut gardeners, were prepared by the Agricultural Department and submitted to the District Village Improvement Committees concerned.

(82) In Gujarat, grants have been made from rural uplift funds to Taluka Development Associations to assist these organizations in supplying pure seed of improved varieties of crops, manures and implements at concession rates to their members. In addition, a demonstration silo is being erected at Sanand and money has been made available for the supply of breeding bulls in the districts. At Broach, the Collector organized a special class for the training of workers in rural improvement methods which was attended by over 100 persons. An Agricultural and Cattle Exhibition was held at Bardoli in January, 1937, as part of rural uplift propaganda.

(83) Under the Livestock Expert to Government, the undernoted schemes were carried out as rural uplift work :—

(*a*) Improvement of the buffalo and its milk supply.

(*b*) Improvement of poultry in villages.

(*c*) Encouragement of pedigree poultry keeping in villages by premia to approved poultry farms.

(*d*) Co-operative egg collecting, grading and marketing.

The work done under these schemes is dealt with in the "Livestock Work" section of this Report and in the detailed report of the Livestock Expert to Government.

Section VI.

Miscellaneous.

(*1*) *Agricultural Marketing.*

(84) (*a*) *All-India Marketing Investigation.*—In connection with the All-India Marketing Investigation, work in the Bombay Presidency is now in charge of the Professor of Agricultural Economics, Agricultural College, Poona. During the year, reports on market surveys of hides and skins and coffee were prepared and submitted to the Agricultural Marketing Adviser to the Government of India. Further market surveys on barley, gram, markets and fairs, cocoanuts, mangoes, potatoes, butter and ghi, wool, sheep and goats, mustard and rape seed are in progress. The results of these surveys are of great importance and value to future development of marketing practices in the Presidency.

(85) (*b*) *Cotton Marketing.*—During the year under report, the organization of cotton marketing in the interests of the primary producers was continued and, in addition to the regulated cotton markets at Dhulia and Amalner, reported upon in last year's report, cotton markets under the Bombay Cotton Markets Act were established and worked at Bailhongal, Southern Division, and at Baramati, South-Central Division. At Bailhongal, 53,000 dokras of kapas and 2,200 dokras of lint were sold in the cotton market during the season and good prices were obtained for the growers by the system of auction sales. The arrivals at Bailhongal increased considerably indicating that the cotton-growers fully appreciate the value of the market facilities. Similar success followed the establishment of the Baramati cotton market where about 10,000 carts of cultivators' cotton were disposed of in regulated sales. Efforts are now being made to establish cotton markets under the Act at Dondaicha, Jalgaon, Bijapur, Gadag, Nargund and at several centres in Gujarat.

Grading and auction sales of Jayawant and Gadag No. 1 cotton were carried out in the Southern Division in connection with the seed multiplication and extension scheme for these improved cottons. The extra price realised by the growers at such auctions averaged about Rs. 10 per naga of 1,344 lbs. seed cotton.

(86) (*c*) *Fruit and vegetable marketing.*—The local Government established a Provincial Fruit and Vegetable Marketing Committee during the year under report which is presided over by the Horticulturist to Government. The first meeting was held in January, 1937, when many important

matters relating to the improvement of fruit and vegetable marketing in the Presidency were considered. The Agricultural Department rendered much technical advice and assistance to the Bombay Fruit Growers' Association in the despatch of consignments of Indian mangoes and other fruits to Europe during the year under report.

(2) *Agricultural Engineering.*

(87) (*a*) *Tractor ploughing against hariali in the Southern Division.*—During the year under report, tractor ploughing for the removal of hariali was continued in the Southern Division by the Karnatak Agricultural and Transport Company. This deep-rooted weed is one of the greatest pests of cultivation in the Karnatak and causes serious losses to land-owners in Belgaum and Dharwar districts. The Company ploughed 1,746 acres to a depth of 12 inches and a suitable and effective technique for the total removal of the weed has now been evolved. The organisation of local syndicates to facilitate the extension of hariali eradication in the Southern Division is now under consideration.

(88) (*b*) *Agricultural engineering service.*—The Agricultural Engineer to Government dealt with 244 enquiries for advice in connection with the installation and maintenance of agricultural machinery as compared with 189 in the previous year. The Mechanical Assistants in the districts were re-transferred to the control of the Agricultural Engineer from the 1st April, 1937, since which date, they surveyed 6 sites, inspected 59 plants and did erection and repair work at 9 centres. Fifteen boring machines were given on hire by the Department and two were sold. The total receipts from hire and sale of material was Rs. 26,240.

(3) *Poona Agricultural College—Services rendered by Heads of Sections in expert advice, etc.*

(89) The extent to which advice and assistance is rendered to the public and to Government Departments by the expert officers in charge of sections of the Agricultural College, Poona, is not generally appreciated but this work forms a very important and extensive part of their activities. During the year under report, the Agricultural Chemist to Government carried out the analysis of 629 samples, of which 381 were of soils, 32 of water, 28 of feeding stuffs, 42 of oilseeds and the remainder, miscellaneous. The Professor of Agriculture

received and answered 800 enquiries dealing with implements, crop cultivation, manuring, soils, dairy management, etc., and 46 bull services were given to the public from the College herd. In addition, he organised three demonstrations of sanitary milk production at Sholapur, Bijapur and Poona. The Economic Botanist to Government carried out tests on 87 seed samples and received over 300 enquiries regarding the identification of plants and other botanical matters. Similarly, the Heads of the Plant Pathology and Entomology sections at the College dealt with a large number of enquiries from the public in connection with their respective sciences and, in addition, organised numerous demonstrations, in co-operation with the territorial Deputy Directors of Agriculture, of control measures against plant diseases and insect pests of crops in the Presidency. Considerable work is also involved in the issue of phytopathological certificates to the public, fruit inspection, etc., by these two officers. The Horticulturist to Government replied to 1,317 enquiries regarding fruit cultivation, preparation of fruit products, etc., from the public. This type of work is increasing year by year which indicates a growing appreciation on the part of the public of the facilities for advice and assistance which the expert staff at the Agricultural College are rendering.

CHAPTER IV.

AGRICULTURAL EDUCATION.

(90) *The College of Agriculture, Poona.*—The Poona Agricultural College is the only institution in the Bombay Presidency devoted to higher agricultural education in addition to scientific research work and the supply of expert advice to agriculturists on agricultural problems. During the year under report, the number of students, who attended the College, showed no diminution.

The new curricula at the College is now in full force, the first batch of B.Sc. (Agric.) students passing out during the year under report. . The last examination for the old B.A.g. degree was held during the year. Special courses were, as usual, held at the College, the number of students attending being 24, as compared with 15 in the previous year, indicating that the demand for such specialized practical training is increasing. The Agricultural Graduates Employment Bureau, which is maintained at the College in order to assist agricultural graduates to find suitable employment at the end of their College careers, had 94 registered members on its roll, including 10 new members added during the year under report. 14 enquiries were received from employing agencies and were circulated among members of the Bureau. It is obvious, however, that many graduates are finding employment without the assistance of the Bureau and that the recent impetus to rural uplift and agricultural development in all parts of India must result in greater opportunities for service for men who are trained in scientific agriculture and animal husbandry.

The research and advisory activities at the College are reviewed in the chapters of this Report dealing with these subjects.

(91) *Vernacular Agricultural Schools.*—The two vernacular agricultural schools at Devi-hosur and Dhulia continued during the year under report. The Devi-hosur school completed its 23rd year and has now got 301 passed students to its credit. These passed students have formed an association which meets from time to time and which has organised a co-operative credit society and a sale union among its members, many of whom take an active part in propaganda work towards improved agriculture in their villages.

At Dhulia, 30 students attended the school, fifteen in the first year and an equal number in the second year. Horticultural and poultry-keeping sections have been developed and the

Local Agricultural School Committee continued to manage the finances of the institution efficiently.

The vernacular agricultural school established at Rajapur in 1929 is doing very useful work and is gaining in popularity each year. This progress is largely due to the enthusiasm of the Principal of the English School, Mr. Kulkarni, who was the moving spirit in the establishment of the agricultural school.

(92) *Agricultural Bias Classes.*—The number of agricultural bias classes remained unchanged at 93 during the year under report. The largest number in any district is 13 in Belgaum. Further extension of these schools is impossible without more trained teachers without which this movement cannot possibly succeed. It seems desirable that promising students at such classes should be trained for teaching work in the future. Rural clubs have been started in connection with most of the agricultural bias classes and fill a useful function in establishing contact with the past students and maintaining their interest in improved agriculture.

(93) *Miscellaneous.*—A training class for oil-engine mechanics was conducted by the Agricultural Engineer to Government. Twenty-four applications for admission were received of which thirteen students were admitted and received special training in oil-engine management and care. Twelve students attended the practical training classes in horticulture at the Ganeshkhind Fruit Experimental Station and, in addition, district classes in horticulture were organized by the Horticulturist to Government at Satara, Gokak, Palghar, Malsiras and Dahigaon and attended by over 500 pupils.

CHAPTER V.

ADMINISTRATION AND FINANCE.

(94) *Introduction.*—The general administration of the Agricultural Department continues to make ever-increasing demands upon the Director of Agriculture and the senior officers of the Department on account of the rapid and extensive development of all branches of departmental activities, especially in connection with rural uplift work, district demonstration and propaganda and scientific agricultural research. The increased co-ordination of the work of the Agricultural Departments in India under such organizations as the Imperial Council of Agricultural Research and the Indian Central Cotton Committee, while undoubtedly contributing largely to efficient and well-planned agricultural development, has resulted in a considerable increase in the administrative work of the Department. All the officers of the Department have borne their share of this additional burden which has been willingly shouldered in the interests of the cultivators of the Presidency.

SECTION I.

ADMINISTRATION.

(95) *Staff.*—Dr. W. Burns held charge of the post of Director of Agriculture during the year under report until the 21st August 1936, when he was deputed to officiate as Agricultural Expert, Imperial Council of Agricultural Research under the Government of India. He was relieved by Mr. B. S. Patel, Deputy Director of Agriculture, Gujarat, until the 9th November 1936. On that date, Mr. W. J. Jenkins, who had held the appointment of Chief Agricultural Officer in Sind for six and a half years, reverted to the Bombay Presidency and took over the duties of the post of Director of Agriculture. Mr. B. S. Patel proceeded on leave for four months from the 9th November 1936, and on his return to duty, was appointed to officiate as Livestock Expert to Government in the leave vacancy of the permanent incumbent of that post, Mr. E. J. Bruen who proceeded on leave out of India for eight months from the 31st March 1937. During the period between his return from leave and his assumption of the duties of Livestock Expert to Government, Mr. B. S. Patel was placed on special duty in the office of the Livestock Expert.

Rao Bahadur V. A. Tamhane, on reversion from Sind, took charge of the post of Deputy Director of Agriculture, Gujarat, on the 19th May 1937, relieving Mr. G. P. Patil, who had been appointed to act in that post during the absence of Mr. B. S. Patel who was officiating in higher appointments.

Mr. E. J. Bruen, Livestock Expert to Government, continued to be in charge of the marketing survey work in the Presidency until the 5th February 1937, in addition to his own duties. From that date, however, this work was transferred to Professor M. B. Ghatge, Professor of Agricultural Economics, at the Poona Agricultural College.

Mr. V. G. Gokhale, Principal, Agricultural College, Poona, and Professor of Agriculture, held charge of the post of Agricultural Chemist to Government, in addition to his own duties from the 1st September 1936, when Rao Bahadur D. L. Sahasrabuddhe, the permanent Agricultural Chemist to Government, retired from service. On the 23rd December 1936, this post was filled by the appointment of Dr. J. A. Daji. Mr. Gokhale was on leave for two months from the 30th March 1937, and, during his absence, Dr. G. S. Cheema, Horticulturist to Government, and Mr. K. S. Kulkarni, Assistant Professor of Agriculture, officiated as Principal and Professor of Agriculture, respectively, in addition to their own duties.

Dr. B. N. Uppal, Plant Pathologist to Government, was promoted from Class II to Class I of the Bombay Provincial Agricultural Service from the 13th May 1936. He went on leave for 19 days from the 1st May 1937.

Mr. L. S. S. Kumar, Economic Botanist to Government, went on deputation from the 15th June 1937, to attend the Fourth International Grassland Conference held in the United Kingdom at which Mr. E. J. Bruen, Livestock Expert to Government (on leave), was also present as representatives of the local Government. During Mr. Kumar's absence out of India, Mr. V. M. Chavan, Assistant Professor of Botany, was appointed to act as Economic Botanist to Government and Mr. S. R. Godbole, Agricultural Overseer, as Assistant Professor of Botany.

Dr. M. B. Ghatge, Agricultural Overseer, was appointed Professor of Agricultural Economics, Agricultural College, Poona, from the 29th August 1936, during the period of deputation, from the 17th February 1935, of Dr. T. G. Shirname on the central staff of the marketing survey organisation under the Government of India.

Mr. J. P. Trivedi, Professor of Agricultural Engineering, Physics and Mathematics at the Agricultural College, was on leave for two months from the 10th May 1937 during which period Mr. A. A. Vasavada, Lecturer in Agricultural Engineering, officiated in that post.

Mr. H. G. Baluch, Assistant Professor of Dairying and Manager, Agricultural College Dairy, returned from leave out of India on the 28th November 1936, and Mr. A. K. B. Cazi, who had been officiating during the absence of Mr. Baluch, reverted to his position as Agricultural Overseer.

Mr. T. N. Jhaveri, Professor of Entomology, Agricultural College, was on leave for 2 months and 12 days, from 15th January 1937. During this period Dr. V. G. Deshpande, Lecturer in Entomology, officiated for him from the 17th January 1937.

Dr. M. K. Patel, Assistant Professor of Mycology, Agricultural College, went on leave for 1 month and 1 day from 30th March 1937, and acted as Plant Pathologist to Government from 1st to 19th May 1937, in the absence on leave of Dr. B. N. Uppal.

With regard to the staff of the Agricultural Department in the districts, Rao Saheb G. L. Kottur, Cotton Breeder, Dharwar, was on leave on medical certificate for 3 months

from 1st August 1936. Mr. S. V. Shevade, Cotton Superintendent, Dharwar, who was on deputation as Cotton Superintendent, Banilla Cotton Seed Distribution Scheme, Khandesh, retired from service on the 7th March 1937, and Mr. V. G. Pavate continued to act as Cotton Superintendent, Southern Maratha Country, Dharwar.

Mr. G. B. Patel, Cotton Breeder, North Gujarat, Viramgaon, returned from combined leave of 28 months on the 1st October 1936 and Mr. V. M. Majumdar, who had been acting in that post, reverted to his original appointment as Agricultural Overseer from the same date. Mr. C. S. Patel, Cotton Superintendent, Surat, was on leave for one month from 25th June 1936, preparatory to retirement and retired from service on the 25th July 1936. Mr. G. P. Pathak continued to act as Cotton Superintendent, Surat, and was confirmed in that post from the 25th July 1936, the date of Mr. C. S. Patel's retirement. Mr. Pathak held charge of the post of Deputy Director of Agriculture, Gujarat, in addition to his own duties, from the 19th August 1936, to the 27th November 1936, until relieved by Mr. G. P. Patil. Mr. H. M. Desai, Agricultural Overseer, officiated as Cotton Superintendent, Surat, when Mr. Pathak went on leave for one month from 11th March 1937.

Mr. G. P. Patil acted as Professor of Agricultural Economics, Agricultural College, until the 29th August 1936, when he was relieved by Professor M. B. Ghatge and from that date, he reverted as Officiating Divisional Superintendent of Agriculture, Deccan Canals. Prior to Mr. Patil's reversion, Mr. S. B. Jadhav, Agricultural Overseer, acted as Divisional Superintendent of Agriculture, Deccan Canals. The same officer acted in this post from the 28th November 1936 to the 18th May 1937 when Mr. G. P. Patil was officiating as Deputy Director of Agriculture, Gujarat.

Mr. K. F. Kheshwala was appointed from the 2nd January 1937 to the temporary post of Assistant Plant Pathologist, created for a period of 5 years from 1st April 1936 in connection with investigations into the *koleroga* disease of betel-nuts. He was on leave on medical certificate for four months from 7th April 1937.

Rao Saheb B. P. Vagholkar, Principal Agricultural Officer, Sugarcane Research Scheme, Padegaon, was on leave on medical certificate from the 11th November 1936 to the 28th February 1937. During this period Dr. R. D. Rege, Crop Physiologist under the scheme, held charge of the post

in addition to his own duties. Dr. J. K. Basu, Soil Physicist, Padegaon, was on leave for one month from 20th March 1937 and Dr. R. D. Rege for one month from the 6th May 1937. No substitutes were appointed in these leave vacancies.

Dr. V. N. Gokhale, Agricultural Overseer, was appointed to the post of Assistant Investigator, Dry Farming Research scheme, with effect from the 3rd March 1937.

Mr. R. Y. Hulkoti, Inspector of Agricultural Schools, has been on leave since 30th March 1937.

Khan Saheb F. J. Master, Personal Assistant to the Director of Agriculture, continued on leave till the 31st March 1937 when he retired from Government service. Mr. V. G. Kelkar, Senior Superintendent in the Director's office, has continued to act as Personal Assistant from 1st April 1937.

During the year under report, Mr. K. V. Joshi continued to act as Deputy Director of Agriculture, North Central Division, Nasik, and Rao Saheb B. P. Vagholkar and Mr. N. V. Kanitkar continued on deputation under the Sugarcane Research Scheme, Padegaon, and the Dry Farming Research Scheme, Sholapur, respectively, during the year. In their absence, Mr. V. V. Gadgil continued to act as Deputy Director of Agriculture, South-Central Division, Poona, and Mr. N. Narayana, as Assistant Professor of Chemistry, Poona Agricultural College.

(96) *Retirements.*—During the year under report, the Department of Agriculture has lost four senior gazetted officers by retirement under the age limit. These are Rao Bahadur D. L. Sahasrabuddhe, Agricultural Chemist to Government, Mr. C. S. Patel, Cotton Superintendent, Surat, Khan Saheb F. J. Master, Personal Assistant to the Director of Agriculture, and Mr. S. V. Shevade, Cotton Superintendent, Dharwar. Rao Bahadur Sahasrabuddhe entered the service of the Department as an Agricultural Overseer in 1907 and reached gazetted rank as Assistant Professor of Chemistry in 1913. Six years later, he was appointed Agricultural Chemist to Government and received the title of Rao Bahadur in 1926. He was a most successful research worker and teacher and will long be remembered by his former colleagues and students whose best wishes accompany him into retirement. Khan Saheb F. J. Master entered service as a clerk in 1903, and, after performing excellent work in all sections of the Director of Agriculture's office, was appointed to the post of Personal Assistant in 1921. He was a

man of great ability and extreme industry and his meritorious service was rewarded by the title of Khan Saheb in 1936. The two Cotton Superintendents, Messrs. Patel and Shevade joined the Department in non-gazetted posts in 1905 and 1906, respectively, and by dint of hard work and ability in district propaganda reached the gazetted posts of Cotton Superintendent in 1921 and 1935. Mr. C. S. Patel officiated on more than one occasion as Deputy Director of Agriculture and the considerable progress in the extension of improved cottons in Gujarat owes much to his zeal and enthusiasm. Mr. Shevade spent the major portion of his service on the Government Farm, Dharwar, where he did excellent work. During the last three years of his service, he was on deputation in charge of the Banilla cotton seed distribution scheme, Khandesh, in which his experience and tact were most valuable. The retirement of four such able and experienced officers in one year is a great loss to the Agricultural Department in the work of which they have taken such a prominent part for many years.

SECTION II—FINANCE.

(*a*) Departmental Expenditure and Receipts.

(97) The expenditure of the Agricultural Department during the year under report was Rs. 11,43,207 as against Rs. 11,69,996 in the preceding year. The decrease was due partly to reduction in administrative costs on account of the retirement of senior officers and partly to the effect of measures of economy introduced into the working of the Department.

The receipts of the Department were Rs. 2,07,539 as compared with Rs. 2,06,698 in the previous year.

(*b*) Subsidies and Grants.

(98) The under-noted subsidies and grants were placed at the disposal of the Director of Agriculture for approved schemes of agricultural research, seed distribution, rural uplift, etc., during the year under report, by the

(1) Imperial Council of Agricultural Research,

(2) Indian Central Cotton Committee,

(3) Sir Sassoon David Trust Fund,

(4) Village improvement grants, made by the Central Government,

(5) Donations to His Excellency the Viceroy's Cattle Improvement Scheme.

(1) *Imperial Council of Agricultural Research.*

Name of the Scheme.	Grant.	Expenditure.
	Rs.	Rs.
1. *Sugarcane Research Scheme*	86,482	85,308
Total ..	86,482	85,308
Deduct Government contribution	—23,300	—22,934
Net grant from the Imperial Council of Agricultural Research	63,182	62,374

Name of the Scheme.	Grant.	Expenditure.
	Rs.	Rs.
2. *Dry Farming Research Scheme*	*42,388*	*42,314*
Total ..	42,388	42,314
Deduct Government contribution	*—14,200*	*—14,197*
Net grant from the Imperial Council of Agricultural Research	*28,188*	*28,117*
3. *Cold Storage Research Scheme*	18,440	16,209
4. *Economic Enquiry Scheme*	10,310	10,309
5. *Scheme for the Improvement of Marketing in India* ..	*23,703*	*21,990*
Total ..	23,703	21,990
Deduct Bombay Government's contribution	*—3,703*	*—3,703*
Net grant from the Imperial Council of Agricultural Research	20,000	18,287
6. *Scheme for Village Enquiry regarding Cattle and Production and Consumption of Milk*	3,860	3,758
7. *Poultry Breeding Scheme*	*20,123*	*16,369*
Deduct Bombay Government's contribution	*—1,683*	*—1,474*
Net grant from the Imperial Council of Agricultural Research	*18,440*	*14,895*
8. *Co-operative Experiments on Tobacco in India* ..	*2,672*	*2,662*
Total ..	2,672	2,662
Deduct Bombay Government's contribution	*—1,422*	*—1,412*
Net grant from the Imperial Council of Agricultural Research	*1,250*	*1,250*
9. *Gas Storage Research Scheme*	3,235	2,811
10. *Pedigree Herd Books*	650	422

(2) *Indian Central Cotton Committee.*

	Name of the Scheme.	Grant.	Expenditure.
		Rs.	Rs.
1.	Broach Cotton Breeding Scheme	10,502	9,291
2.	Jalgaon Cotton Breeding Scheme	9,045	8,727
3.	Hubli Seed Distribution Scheme	957	871
4.	Gadag Seed Distribution Scheme	977	842
5.	Athani Seed Distribution Scheme	910	910
6.	Surat Seed Distribution Scheme	11,373	10,894
7.	Khandesh Seed Distribution Scheme and clerks for Bombay Schemes	30,356	28,771
8.	Banilla Seed Scheme on Deccan Canals	4,670	4,602
9.	Survey of Goghari Cotton	1,135	1,121
10.	Plant Puller Propaganda Scheme	4,800	4,768
11.	Technological Assistant for Gujerat	3,642	3,439
12.	Cotton Forecast Improvement Scheme	5,558	5,504
13.	Defibration of Cotton Seed	1,709	733
14.	Training grant to Mr. G. B. Patel	2,868	3,091
15.	B.D. 8 cotton seed Distribution Scheme	3,014	2,949
16.	Estimation of effects on the cotton of the use of Plant Pullers	1,340	1,014
17.	Revised Jayawant Cotton Seed Scheme	24,595	16,674
18.	Revised Gadag No. 1 Seed Scheme	8,626	7,273
	Total ..	1,26,077	1,11,474

(3) *Sir Sassoon David Trust Fund.*

	Rs.
(*a*) Further grant for the investigations in connection with the improvement of grazing lands ..	491
(*b*) Further grant for Linseed Research Scheme ..	3,108
(*c*) Further grant for the Vegetable Research Scheme .	3,772
(*d*) Further grant for the research work on the wilt disease of Sann Hemp	2,851
(*e*) Further grant-in-aid to the Vernacular Agricultural School, Dhulia	500
Total ..	10,722

(4) *Village Improvement Scheme grants made by the Central Government.*

Name of the Scheme.	Grant.	Expenditure.
	Rs.	Rs.
1. Scheme for Improvement of the Buffalo and its Milk Supply	7,597	7,523
2. Scheme for the Improvement of Poultry in villages ..	2,728	2,464
3. Scheme for the encouragement of Pedigree Poultry Keeping in villages	600	349
4. Scheme for Co-operative Egg-collecting, grading and marketing	475	461
Total ..	11,400	10,797

(5) *His Excellency the Viceroy's Cattle Improvement Scheme.*

Division.	Total amount of donations received.	Expenditure.	Balance.
	Rs.	Rs.	Rs.
Gujarat	18,061	1,799	16,262
North Central	29,002	5,367	23,635
South Central	4,493	410	4,083
Southern	10,780	1,624	9,156
Total ..	62,336	9,200	53,136

(c) Personal Ledger Account of the Director of Agriculture.

(99) The total advance under the Director of Agriculture's Personal Ledger Account (Ordinary), which is placed at his disposal for financing the distribution of improved seeds, implements, etc., was temporarily increased from Rs. 1,50,000

to Rs. 1,83,000, the addition of Rs. 33,000 being pecially sanctioned by Government for financing the distribution and extension of the seed of improved varieties of cotton in the Southern Division.

The total advance made during the year under report, i.e. 1936-37, was Rs. 1,23,264-2-7 and the recoveries made amounted to Rs. 1,81,349-6-9 as detailed in the statement given hereunder :—

Month.	——	Advances.	Recoveries.
		Rs. a. p.	Rs. a. p.
Opening balance on 1st April 1936.	As shown in the last report ..		73,384 6 2
	Subsequent adjustments.		—77 1 3
			73,307 4 11
1936			
April	....	50,063 12 0	11,819 5 0
May	....	38,264 5 3	29,749 15 3
June	....	4,372 0 4	80,589 8 0
July	....	799 15 0	15,363 15 3
August	....	....	3,726 12 8
September	....	11,186 12 0	1,049 10 2
October	....	107 7 3	3,374 5 9
November	....	23 6 0	3,629 14 3
December	....	2,000 0 0	5,062 9 4
1937			
January	....	....	10,084 3 7
February	....	272 9 9	12,089 15 9
March	....	16,173 15 0	4,829 3 9
Total ..	....	1,23,264 2 7	1,81,349 6 9
Closing balance on 31st March 1937	....	1,31,392 9 1	....
Total ..	....	2,54,656 11 8	2,54,656 11 8

W. J. JENKINS,
Director of Agriculture,
Bombay Presidency.

Poona,
September, 1937.

APPENDIX A.

List of Taluka Development Associations organised up to date.

According to the scheme laid down in Government Resolution No. 3378, dated 5th June 1922, Revenue Department, the number of Taluka Development Associations was 102 at the close of the year 1936-37 distributed over the Divisions of the Bombay Province as shown below :—

Division.	District.	Number.
Gujarat	Surat	3
	Ahmedabad	1
	Kaira	4
North Central	East Khandesh	12
	West Khandesh	8
	Nasik	5
	Thana	3
	Kolaba	2
South Central	Poona	10
	Ahmednagar	12
	Satara	12
	Sholapur	7
	Ratnagiri	8
Southern .. .. .. or Karnatak.	Belgaum	4
	Bijapur	2
	Dharwar	7
	North Kanara	2
	Total ..	102

Subsidies amounting to Rs. 37,879 were granted during the year under report (1936-37) as against Rs. 43,492 granted in the previous year. The reduction in the amount of subsidies granted during the year under report was due to the adoption of the new procedure of granting subsidies to Taluka Development Associations as sanctioned by the Government Resolutions, Revenue Department, Nos. 9805/24, dated 7th April 1936 and 14th September 1936.

The Associations have been classed by the Divisional Boards of Agriculture in order of merit as under :—

Class "A"—The most successful or efficient.

Class "B"—Struggling Associations which deserve help if possible.

Class "C"—Moribund Associations.

Accordingly the number of Associations in each class is as under :—

Division.	Class.		
	A	B	C
Gujarat	8	..	..
North-Central	9	14	7
South-Central	10	38	1
Southern	6	8	1
Total ..	33	60	9

APPENDIX B.

SUMMARY OF WORK DONE AT THE POONA COLLEGE OF AGRICULTURE FOR THE YEAR 1936-37.

This is the twenty-ninth year of the College.

Staff.

The total strength of the staff was twenty-seven.

I was on leave from 30th March 1937 to 29th May 1937 and in my absence Dr. G. S. Cheema acted as Principal.

Professor K. S. Kulkarni, Assistant Professor of Agriculture, was appointed to act as Professor of Agriculture in place of Professor V. G. Gokhale on leave from 30th March 1937 to 29th May 1937.

Professor H. G. Baluch, Assistant Professor of Dairying, who was on long leave joined duties in November 1936.

Professor G. P. Patil, Acting Professor of Agricultural Economics, was transferred and Dr. M. B. Ghatge is appointed as a permanent incumbent of this post from 29th August 1936.

Professor L. S. S. Kumar, Professor of Botany, has gone on deputation from 15th June 1937 and Professor V. M. Chavan has been appointed to act in his place. Mr. S. R. Godbole is appointed to act as Assistant Professor of Botany vice Professor V. M. Chavan.

Rao Bahadur D. L. Sahasrabudhe, Professor of Agricultural Chemistry, retired from service from 1st September 1936 and Dr. J. A. Daji has been appointed in his place from 23rd December 1936 up to which time Principal V. G. Gokhale held the charge of this post.

Dr. B. N. Uppal, Professor of Mycology, was on leave from 1st May 1937 to 19th May 1937 when Dr. M. K. Patel acted for him. Mr. M. N. Kamat acted as Assistant Professor of Mycology from 3rd April 1937 to 19th May 1937 vice Dr. M. K. Patel on leave from 30th March 1937 to 30th April 1937 and while subsequently acting as Professor of Mycology.

Professor J. P. Trivedi, Professor of Agricultural Engineering, Physics and Mathematics, was on leave from 10th May 1937 for two months and Professor A. A. Vasawda acted in his place.

Professor T. N. Jhaveri, Professor of Entomology, was on leave from 17th January 1937 to 26th March 1937 when Dr. V. G. Deshpande, lecturer in Entomology, acted in his place.

There have been a few changes in the personnel of the subordinate staff of Lecturers and Demonstrators.

Equipment.

One hundred and one books were added to the Library during the year under report bringing up the total number to 7,720 apart from periodical journals and magazines. A more scientific and convenient

classification of books is under consideration. Out of the total grant of Rs. 5,000 for the equipment of the Library sanctioned last year by Government only Rs. 1,000 have been actually allotted for expenditure during the first six months of 1937-38.

Out of the total grant of Rs. 16,873 promised to be sanctioned in a period of five years for improving the laboratories and equipment for the revised Curricula, only Rs. 2,939 have been actually allotted for expenditure during the first six months of the current year 1937-38.

The laboratory and office accommodation available for research at the institution is being more and more congested by trying to provide for the several new schemes financed by the Imperial Council of Agricultural Research and the David Sassoon Trust Fund, etc.

Curricula.

The new curricula are now in full force, the first batch of B.Sc. (Agri.) students passing out this year. The examination for the remnants of the old B.Ag. course was held for the last time.

Studentship.

The number of students that attended during the year was as follows :—

Class.	First term.	Second term.
First Year in Science (Agri.)	85	82
Second Year in Science (Agri.)	42	49
Senior B.Sc. (Agri.)	42	35
	169	166

Examination results.

In the final examination for the degree of Bachelor of Agriculture held in March 1937, 19 appeared and all have passed as against a percentage of 70·4 of last year. The following is the distribution of students according to the optional subjects :—

Serial No.	Subject.	Number appeared.	Number passed.
1	Intensive study of Sugarcane crop	1	1
2	Advanced Plant Breeding	1	1
3	Advanced Animal Husbandry and Dairying ..	1	1
4	Advanced Agricultural Economics	5	5
5	Advanced Horticulture	11	11
	Total ..	19	19

The results of the First, Second and Final year examinations according to the revised curricula are given in the following table :—

Serial No.	Examination.	Number appeared.	Number passed.	Percentage.
1	First Year in Science (Agri.) ..	93	59	63·4
2	Second Year in Science (Agri.) ..	60	53	88·3
3	Bachelor of Science (Agri.) ..	35	23	65·7

Comparison with the previous University results.—The percentage of successful candidates in the University examinations during the last triennium is as follows :—

Examination.	1935.	1936.	1937.
First Year in Science (Agri.)	70·5	52·5	63·4
Second Year in Science (Agri.)	No University examination.	57·1	88·3
Bachelor of Science (Agri.)	No examinations in these years.		65·7

The better performance in the year under report is attributed to better calibre owing to a higher standard that could be secured in the case of the First year, and in that of the Second year probably to a severe test in the preceding First Year.

Post-graduate Degree Courses.

The position in this regard is explained in the following table :—

Name of section.	For what degree.	Studying in				Examination.	
		1st year.	2nd year.	3rd year.	Total.	No. appeared.	No. passed.
Agriculture ..	M.Ag. ..	1	..	..	1	..	..
Chemistry ..	M.Sc. ..	..	2	1	3	..	..
Do. ..	Ph.D. ..	..	1	..	1	1	1
Entomology ..	M.Ag. ..	..	1	..	1	..	..

Special Courses.

Special courses were offered as follows :—

Serial No.	Subject taught.	No. of students.	Periods.
1	Veterinary	2	1 month.
		1	3 months.
		1	4 months.
		4	
2	Dairying	3	1 month.
		2	5 months.
		2	2 months.
		7	
3	Horticulture	1	9 months.
		1	8 months.
		1	3 months.
		3	1 month.
		6	
4	Engineering	1	2 months.
5	Chemistry	3	1 month.
6	Plant Pathology	1	11 months.
		1	2 months.
7	Botany	1	7 months.

Careers of Graduates.

With 10 members added during the year, the number of registered members on the rolls of the Agricultural Graduate's Employment Board is 94. It appears that agricultural graduates are finding employment without the assistance of the Board. During the year fourteen enquiries were received from employing agencies, and these enquiries were circulated promptly to the registered members. In spite of repeated requests, the members have not cared to inform the Board of their success in obtaining suitable employment through the agency of the Board.

Dr. B. N. Uppal was renominated for another period of three years as the Secretary-Treasurer of the Board. Mr. B. S. Patel was nominated by the Director of Agriculture, Bombay, Poona, as a member for three years in place of Mr. V. V. Gadgil.

Admissions for 1937–38.

For the B.Sc. (Agri.) Degree Course.—In all, 83 from the Bombay Presidency with Sind separated, and 58 outside Bombay Presidency duly qualified candidates applied for admission to the first year class. The latter included 34 from Sind alone. Of these,

respectively 83 and 28 were given admission, and 67 and 19 attended actually for some or all days till the end of June 1937, i.e. 20 days after the commencement of the new session. But on 1st July only 55 from the Bombay Presidency and 16 from outside including nine from Sind remained permanently as against the total of 78 in the last year.

The educational standard of the new applicants from the Bombay University is lower than in the last year, about 25·8 per cent. as against 33 per cent. of last year having scored above 40 per cent. in their First Year in Arts Examination. All those who have come from Universities other than Bombay have to pass Intermediate Examination in Arts or Science.

The Uniform dress of Khaki short and shirt for students was continued.

For Post Graduate Degree Courses.—One student has been registered for Botany during the first month of the new session falling in the year under report.

For Special Courses.—Four students have been admitted in the Dairy course.

Scholarships.

The number of scholarships tenable for 3 years continued to be the same as in the previous year., viz. 5 for Backward Classes including Mohamedans and 3 for General Competition in each of the three classes.

The Students' Hostel.

The total number of students accommodated in the Hostel is 128, whereas there is accommodation for 132 students. The scheme for electric lighting of the Hostel through the agency of the College Gymkhana was sanctioned by Government and has actually been brought into operation from the beginning of the new session.

Students' Co-operative Stores.

The membership of the store rose during the year to 162 from 68 at the end of the preceding year, after the year's withdrawals and transfers numbering 3. The total share capital is Rs. 442.

The total sales consisting of about 45 per cent. of food provisions, 40 per cent. of fuel, coal, kerosine, 12 per cent. stationery and 3 per cent. miscellaneous articles, amounted to Rs. 7,422 during the year as against Rs. 8,429 of the previous year. The lower sales during the year resulted from the working of almost all the clubs on contract system during the examination time.

About 57 per cent. of the goods were sold to the members and 43 per cent. to the non-members. All the articles were sold at the same rates as obtained by retail buyers in the Poona market.

After taking out the reserve fund of Rs. 23, a Poor Boys' Fund of Rs. 47 and a dividend at 6¼ per cent., bonus at a little over 2 per cent. of the sales was distributed to the members.

Physical, Sporting and Social activities.

The College Gymkhana.—Professor L. S. S. Kumar continued to be the Chairman throughout the year.

Swimming 100 yard I prize, swimming 200 yard I prize, wrestling Heavy Weight II prize, Cushion Fighting I prize, Foot-ball I prize, were won by the students of the College Gymkhana in the Inter-Collegiate sports.

In the David Cup Cricket Tournment this College team won the first round against the Engineering College XI, but were beaten in the semi-final round by the S. P. College team.

The proposal about the building of a pavilion and the organization of a Boat club for the College Gymkhana are receiving attention. The College Gymkhana has also taken the financial and management responsibility of the Electric Installation scheme of the Hostel at a cost of Rs. 2,400.

The University Training Corps.—As in the past, this College even though of a strength of less than 200 continued to contribute one platoon to the "B" Company of the 1st (Bom.) Bn., U.T.C. (I.T.F.), Poona, in spite of the long hours of attendance including heavy practical work under the able and enthusiastic command of 2nd Lt. V. M. Chavan and with all facilities from the Principal. It included 1 Cadet Sergeant, 2 Cadet Corporals, 6 Lance Corporal.

The platoon qualified itself for the Cross Country run at the Camp and scored well in shooting, two cadets winning the best shooting prizes, the first prize for the best Bn. recruit shot being also won by a Cadet from this platoon. The platoon won the Inter-platoon Hockey Shield and also prizes in 100 yards and one mile flat relay.

Second Lt. V. M. Chavan passed the Retention Examination and completed his four months training in a regular Military unit this year and he will be shortly confirmed as Lieutenant, he is at present acting as the Second in Command of the "B" Company.

The Rovers.—The Agricultural College Rover Crew was in charge of Professor J. P. Trivedi, also a Senior member of the Staff who is the Assistant Provincial Scout Commissioner, C. D. They had a good programme last year.

The Social gathering.—The Annual Social gathering of the past and present students and Staff was held under the presidentship of the Chief guest, V. N. Chandavarkar, Esqr., B.A., Bar-at-Law, Vice-Chancellor, Bombay University.

Students' Literary activities.

The Poona Agricultural College Magazine.—The magazine completed the 28th year of its useful existence, Professor A. K. B. Cazi being the staff editor in the year closed.

The number of subscribers has increased by 20, bringing the total number to 305.

The number of journals, both foreign and Indian, received by exchange has increased by 3 bringing the total number to 40.

With a view to encourage student efforts, a price of Rs. 10 was announced for the best article by any present student but only one such article was received and published.

Agricultural Association and Debating Society.

Mr. Dhamale the Secretary managed the section excellently, the programme being much better than in the past few years.

Students' Guardianships.

This was continued. Its usefulness and appreciation were determined by the interest and influence the tutors were able to exert.

Aid and Assistance to the Public.

Veterinary Hospital.—Apart from the main purpose of practical instructions to the students of the College, it has continued to help the public as in the past.

The number of in-and out-patients during the year was 462 and 5,050 respectively as against 516 and 4,696 respectively in the previous year. Goat-Virus vaccination against rinderpest was carried out for all goat animals available for the purpose.

Research and Advice.

The function of this institution is no less of research and advice than of teaching. In fact about 60 per cent. of the total budgets of the sections at the College is spent on research and advice. All the staff of the College have carried on research and advisory work in the time available after satisfying the needs of teaching and administration of their respective sections. Summaries of such research and advisory work are embodied in the reports of the respective Heads of Sections which are appended to this Annual Report.

Visitors.

Amongst the many visitors including 11 students' parties the following may be prominently mentioned :—

1. Mr. T. T. Kothavala, M.A., B.Sc., J.P. Officiating Secretary, Revenue Department.

2. Mr. V. N. Chandavarkar, B.A., Bar-at-law, Vice-Chancellor, Bombay University.

3. Dr. N. C. Wright, Dairy Expert of the Government of India.

4. Sir John Russell, Director, Rothamsted Agricultural Research Station, England and Advisor to the Government of India on the work of the Imperial Council of Agricultural Research in India.

5. Sons of the Shreemant Raje Bhousale of Nagpur.

V. G. GOKHALE,
Principal,
College of Agriculture, Poona.

COLLEGE OF AGRICULTURE,
POONA.
August 5, 1937.

Programme of work for the year 1937-38.

ADMINISTRATION AND CONTROL OVER THE TEACHING ACTIVITIES AND WELFARE OF THE STUDENTS OF THE COLLEGE.

V. G. GOKHALE.
Principal,
College of Agriculture, Poona.

POONA,
Dated 5th August 1937.

APPENDIX C.

Summary of work done under the Deputy Director of Agriculture, North Central Division, for the year 1936–37.

I. AGRICULTURAL CONDITIONS.

In the districts of Thana and Kolaba, the monsoons broke out at the usual time in June and gave well distributed rainfall throughout the kharif season. This proved beneficial to the crops and normal harvests were reaped. In November, however, heavy and prolonged rains were received which damaged late varieties of rice crop by lodging.

In Nasik and Khandesh, kharif rains commenced at the usual time and were favourable for sowing and early growth of crops. The monsoons, however, soon weakened and during July and August there were long spells of draught. The whole of July was practically dry everywhere. The prospects of crops became gloomy and in eastern and north-western parts of Nasik and central and south-western parts of West Khandesh, famine was threatened. In September, the monsoons revived and fairly good rain was received which relieved the situation to a considerable extent in most parts except where kharif sowings had failed. The crops improved and fairly good harvests were reaped in the greater part of Khandesh. These rains also proved favourable for sowing of rabi crops. October was again dry and rabi sowings had to be suspended in parts. This dry spell continued till the second week of November and the young rabi crops began to wither. There were no signs of further rains and the situation again became very anxious. At this critical stage, a strong cyclone suddenly developed and gave copious rains lasting for about ten days. These were almost universal and averted what would otherwise have been a year of scarcity and famine in parts of Nasik and West Khandesh. The rainy season was thus characterised by periods of trying conditions all along, causing scarcity of fodder, grazing and drinking water. The September and November rains, not only invigorated the standing crops but they also created soil conditions favourable for new sowings. Bajri and jowar, mostly for fodder, were sown in vacant kharif lands on a large scale. These rains, however, caused damage to kharif jowar in East Khandesh by lodging.

Cotton gave normal yield except in drought-stricken areas of Nasik and West Khandesh. Groundnut, bajri and kharif jowar could not make up the ill-effects of dry spells in July and August and yielded from 60 to 70 per cent. of the normal. Wheat and rabi jowar in Khandesh gave normal yields but in Nasik their yields were about 66 per cent. Jowar suffered from deficiency of moisture in the soil and wheat from heavy attack of rust. Wilt on cotton was less. Rats caused some damage to wheat in parts of Khandesh, but this was negligible.

Deficiency of rainfall and long dry spells caused considerable hardships to cattle by shortage of drinking water, grazing and fodder. There were

large migrations of cattle to hilly tracts and several cattle died and many were sold away at low prices. Shortage of cattle was likely to be felt in the drought-stricken areas next year.

Due to drought that prevailed in Kharif season, prices of fodder and food grains rose high and remained so in parts of Nasik and West Khandesh till the situation was relieved by the September and November rains. Prices of cotton were more or less similar to those of the previous year but groundnut fetched better prices. The general level of prices of food grains remained higher by about 15 to 20 per cent. over that of the last year.

II. RESEARCH AND EXPERIMENT.

COTTON.

1: *Plant Breeding Work.*—The three promising strains of Neglectum Verum, viz. N. V. 57-7, N. V. 56-3 and N.V. 56-17 referred to on page 59 of last year's report were compared for yield in replicated plots on Jalgaon Farm for the third year. Similar trials were also carried out with N. V. 57-7 and N. V. 56-3 on Bhadgaon and Dhulia Farms with Banilla and N. R. 6 as controls. N.V. 56–3 gave results significantly superior to both N. R. 6 and Banilla on Bhadgaon Farm. On Dhulia Farm also this variety gave significant superiority over Banilla. On the Jalgaon Farm, however, none of the strains showed any significance.

Village trials were carried out at 13 places in Khandesh tracts with N.V. 57–7, N.V. 56–3 and local. (Detailed results of trials will be given in Experimental Records.) In seven trials the results were favourable to N.V. 56–3. In four, yields of N.V. 56–3 was equal to that of local and in two, N.V. 56–3 yielded less. The variety N.V. 57–7 is rather early for Khandesh tract. Its plant also is not strong enough. N.V. 56–3 is a stronger plant and matures at the same time as the local. The general opinion in the district is in favour of N. V. 56–3. As regards the quality of wilt resistance, the performance of the three strains confirms the previous experience of high resistance, the percentage of wilt mortality being 0·4, 1·9 and 1·3 for the three strains, N.V. 57–7, N.V. 56–3 and N.V. 56–17 respectively. In ginning, N.V. 56–3 is superior to the other two selections giving 34·5 per cent. ginning outturn as against 33 of N.V. 56–17 and 32 of N.V. 57–7. Their mean fibre lengths were 0·91, 0·88 and 0·93 inches respectively.

In spinning the two verum strains, N.V. 57–7 and N.V. 56–3 maintained their good performance of the previous year, both at Jalgaon and Dhulia Farms and represented as before a notable advance over Banilla in respect of counts and fibre qualities. On the Bhadgaon Farm, however, both these verum cottons, as also Banilla and N. R. were shorter in staple than at Jalgaon and Dhulia and showed a falling of as compared with their performance in the previous year.

N.V. 56–3 type was put to mill test at the Khandesh Spinning and Weaving Mills, Jalgaon. The results showed that the cotton was

suitable for 24's warp counts for a test of 61 lbs. All the produce of N.V. 56–3 cotton (20 bales) grown on Jalgaon Farm was purchased by this Mill at Rs. 212 per Khandi of 784 lbs. as against Rs. 184 for the local. This works to Rs. 20 on Broach in Bombay.

The variety N.V. 56–3 has now been given the name of "JARILA" and a seed multiplication scheme, which was put up before the February meeting of the Indian Central Cotton Committee has been sanctioned for one season in the first instance.

The Khandesh Cotton Breeding Scheme has been extended for a further period of five years, commencing from April 1937 with the objects of (1) further isolation of desirable commercial strains with better ginning and yield and (2) intensive study of wilt-resistant races and isolation of types homogeneous for wilt-resistance. Further work has been planned in these directions.

2. *Spacing Experiments.*—During the year under report, a new experiment regarding proper spacing in sowing for the new strains of cotton (N.V. 56–3) was laid down. The spacings tried were 18 and 24 inches between rows and 6 and 9 inches between plants in the row. The control was the local spacing in which 18 inches seed drill was used. The area of each plot was one guntha. The five treatments were tried in eight replications. Detailed results will be given in the Experimental Records. They show that the spacing 18×6 inches is significant over others, except 24×6 inches. The experiment will be repeated.

3. *Improved Cotton Seed Drill.*—The improved seed drill designed by the Agricultural Engineer to Government was tried in one acre plots. The spacings were tried with the improved drill, viz. 18 and 24 inches and in the third plot, local seed drill was used with its usual spacing of 18 inches. The results gave 1,056 lbs. of cotton with 24 inches and 986 lbs. with 18 inches spacing with the improved drill. The yield of the plot sown with the local drill was 968 lbs. Comparing the yields with 18 inches spacing of the improved and local seed drills, very little advantage becomes manifest. The advantage of the improved drill, however is that the seed drops uniformly at the required depth and distance without increasing the draught. The economic advantage is that the crop needs no thinning and the drill can be operated by one man as against one man and three women in the case of the local drill. The price of the improved seed drill is Rs. 80. The local drill can also be transformed into the improved drill by fitting up a seed box and driving pulleys to it at a cost of about Rs. 35. Further trials will be made.

JOWAR.

Jowar Breeding.—The four promising strains, viz. Nos. 17, 41, 44 and Salsingi, mentioned on page 61 of last year's report were tried for yield in half-guntha plots in four replications. Owing to a severe attack of millipeds in one of the replicated series, the yield in three blocks only could be compared. None of the varieties have given significantly high yield. The results were vitiated by the heavy rainfall that occurred in

the month of November and consequent lodging of the plants. The experiments will be repeated in eight replications.

Jowar Udid Mixture.—The experiment of growing jowar singly and in combination with Udid was concluded in 1935–36 after three years' trials. Detailed results of these experiments have been given in the Experimental Records. The average results are given below :—

Year.	Jowar grown alone.			Jowar grown with udid.				
	Calculated mean yield per acre.			Calculated mean yield per acre.				
	Jowar grain.	Kadbi.	Bhusa.	Jowar grain.	Kadbi.	Bhusa.	Udid grain.	Udid Chaff.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lb .	lbs.
1933–34 ..	1,702	11,063	467	1,683	9,897	467	99	512
1934–35 ..	1,265	4,147	..	1,411	3,584	..	502	653
1935–36 ..	1,209	8,880	..	2,008	8,956	..	282	624

Except in the first year, the results are similar. They show that in plots sown to the mixture of jowar and udid not only the yield of jowar grain is higher but in addition, there is the yield of udid grain and chaff. In the first year, the crop of udid failed due to heavy rains. The local practice is to grow the mixture.

WHEAT.

Manurial Experiment.—A new experiment of finding out the effect of green manuring on wheat was started in the year under report. This was done in six replications in two and half guntha plots. The treatments were Sann-green manuring and no manuring. The average weight of green stuff plowed in was 10,385 lbs. per acre.

The mean yield of wheat per acre in treated plots was 1,219 lbs. and that in control was 1,224 lbs. Detailed results will appear in the Experimental Records. As this was a year of deficient rainfall, no conclusions could be drawn. The experiment will be repeated.

Improved Wheat Seed Drill.—This drill, as designed by the Agricultural Engineer to Government, was used for sowing an area of 12 acres in alternate strips with the country drill. Germination of seed with the new drill was found to be higher by about 5 per cent. This drill is also lighter to work. The price is Rs. 60. The local drill can also be transformed into the improved drill at a cost of Rs. 35.

Wheat Thresher.—This implement also has been designed by the Agricultural Engineer to Government. This was tried for threshing the wheat crop of about 30 acres grown on the Jalgaon Farm. The quantity threshed per day with this implement was 3,050 lbs. as against 2,876 lbs. by local method. With this implement, there is a saving of one

man and eight bullocks, which means a saving of Rs. 2-9-0 per day. This works out to Rs. 1-8-0 per acre. The price of the implement is Rs. 60.

Winnowing Fan.—Still another useful implement designed by the Agricultural Engineer to Government is a Winnowing Fan. Trials made in February 1937 at Nimbgaon in Yawal and Sakegaon in Bhusaval taluka with wheat, showed that the fan winnowed a quantity of 1,440 lbs. per hour as against 400 lbs. with natural wind. The price of the fan is Rs. 60. Apart from the saving in cost, this implement makes the cultivator independent of natural winds.

RICE.

Manurial experiment with oil-cake on rice was continued on the Rice Research Station, Karjat, for the second time. Castor cake and safflower cake were used singly and in combination with Sulphate of Ammonia. The quantities were on the basis of 40 and 60 lbs. Nitrogen per acre. In the case of the combination, 50 lbs. of Nitrogen in the form of each of the cakes and 10 lbs. of Nitrogen as Sulphate of Ammonia were used. There were eight replications of 1/100th of an acre plots. Detailed results will be given in Experimental Records. They show that :—

1. All treatments have given significantly superior yield over no manure like last year.

2. The percentage of increase on the whole, this year is less than last year, the highest increase obtained last year was 73·8 per cent. over no manure plot, whereas it is 49·3 per cent. this year. This is attributable to the season. The yield of no manure plot itself has gone down by ten per cent.

3. Nitrogen in the form of Castor cake is more effective than in safflower cake.

4. 60 lbs. of Nitrogen in the form of cakes have again showed significant increase in yield over 40 lbs.

5. Combination of sulphate of ammonia with oil cakes has not resulted in improving yields over oil cakes alone. This corroborates with last year's finding.

A further test to Professor Dastur's conclusions about rice manuring was given. This again showed that Sulphate of Ammonia given alone is more effective than when given in combination with Nitrate of Soda. Details of results will be given in the Experimental Records.

III. AGRICULTURAL SERVICE AND PROPAGANDA.

PREVENTION OF SOIL EROSION.

As mentioned on page 72 of last year's Report, special propaganda has been organised with the help of the Village Uplift Funds and 977 acres were protected last year. During the year under report, considerable

progress was achieved especially in Yeola taluka of Nasik district, where a special Agricultural Overseer has been located to carry on the work in an intensive manner. He has a tractor plow with tail-sheet attachment for preparing a ridge of ten to twelve inches in height to serve as basic bund and a stock of 25 kenis (wooden scrapers) worked by bullocks for raising the bunds to a height of 2½ to 3 feet.

As a result of intensive propaganda, 102 applications covering about 1,400 acres from 25 villages were received. Out of this an area of 1,250 acres of 68 acres in eight villages was bunded with the tractor plow, the total length of bunds being 203,218 running feet. Most of these further raised by owners of fields to 2 to 3 feet by Kenis. In addition to this, terracing was done without the tractor plow in 17 villages by 23 cultivators with Kenis alone over an area of 591 acres with a total length of bunds running to 44,008 feet. Thirteen cultivators in six villages constructed 13,489 running feet of bunds by manual labour on an area of 256 acres. The total area thus protected against soil erosion in Yeola taluka comes to 2,215 acres with 260,715 feet of bunds. Some of the bunds constructed last year required repairs and raising. These repairs were carried out during the current year on an area of 535 acres. The same overseer also attended to similar work in seven villages in Nandgaon taluka and one in Chalisgaon for 12 and 1 cultivators respectively. The total area protected at these places was 251 acres.

Bunds ten to twelve inches in height raised by the tractor plow cost Re. 0–1–9 per 100 running feet. Further raising them to 2½ feet by Kenis cost from thirteen to fifteen annas. When the work is done by manual labour on contract, the cost comes to from Rs. 1–2–0 to 1–4–0 per 100 running feet for a bund 2½ feet high.

The District Village Improvement Association, Nasik, contributed Rs. 300 for meeting the cost of oils for working the tractor. Out of these, Rs. 188 were spent. The Taluka Development Association, Yeola, also spent Rs. 32 over oils and has stocked 8 Kenis for the work and gave the assistance of its staff for propaganda.

In the other talukas of Nasik district, the staff advised people to prevent erosion of soil and achieved fairly good response. In Malegaon section, bunding work was undertaken in 17 villages on fields of 32 cultivators over an area of 575 acres. In Nasik, Sinnar and Dindori talukas, bunds were constructed on an area of 459 acres in 12 villages by 37 cultivators.

The total area thus protected against erosion in the whole of the Nasik district comes to 3,249 acres.

In West Khandesh, a further grant of Rs. 460 was received from the District Village Improvement Funds and two Kamgars were engaged for propaganda and practical advisory work under the District Agricultural Overseer, Sindkheda. The work was in progress for three months. 506 acres on fields of 36 cultivators in 6 villages were protected. The total length of bunds was 72,580 feet. The expenditure incurred from the grant was Rs. 260.

In East Khandesh, anti-erosion work was continued in Jamner taluka and also in Bhusaval from the balance of Rs. 119 from last year's grant. The area covered was 230 acres on fields of 8 cultivators in five villages. Besides 375 acres were protected in Raver, Yawal and Edlabad. Repairs to last year's bunds were made in Jamner on an area 150 acres in five villages.

IMPROVEMENT OF SOIL FERTILITY.

Compost Manure.—As mentioned on page 73 of last year's report, the District Village Improvement Committee in East Khandesh had granted a sum of Rs. 500 for demonstrating the methods of compost making and crushing bones by charring process. From this allotment a demonstrator was appointed and helped the people to prepare compost and bone manure. Compost was made on 21 farms in 21 villages in the rainy season and on 20 farms in 20 villages in cold season. The aggregate quantity of compost made was 2,886 cart-loads.

In West Khandesh, 53 cart-loads were prepared at three places and in Nasik this was demonstrated at four places. Compost making is regularly practised on the three Government Farms in this division. At Jalgaon, Bhadgaon and Dhulia Farms, 78, 86 and 56 cart-loads were prepared respectively.

Bone Manure.—Charring of bones to facilitate crushing was demonstrated at 17 places in East Khandesh and 24,404 lbs. of bone manure were prepared. In West Khandesh, it was demonstrated at seven places and 7,910 lbs. were obtained. In Nasik, the process was shown at 2 places with 465 lbs. of the material. In Thana, 2,240 and in Kolaba, 3,000 lbs. were crushed by this method.

As a result of the propaganda in previous years, some cultivators use bone-meal from factories. In West Khandesh, Nasik and Kolaba, 2,614 lbs., 649 lbs. and 14,410 lbs. of bone-meal were distributed.

Sann Green Manuring.—Propaganda for improving the fertility of the soil by adding sann green manure was continued in Khandesh. This is recommended on areas grown to wheat in the usual rotation. These fields are fallow in kharif season and thus offer opportunity for growing sann crop for green manuring. This method of manuring, however, cannot be adopted wholesale in all wheat fields every year. The limiting factors are (1) want of long dry period at the time when the crop is to be ploughed in, and (2) want of plow cattle for plowing in the crop. This work synchronizes with the interculturing of other standing crops. People are, therefore, being advised to green manure their fields every fifth year in rotation and this may prove enough for a dry crop of wheat.

From the amount of Rs. 500 of the V. I. funds of the East Khandesh, 14,400 lbs. of sann seed was distributed to 83 cultivators in 9 talukas for sowing in kharif season of 1936 on the system of return of the seed or an equivalent amount at the end of the season. This seed has been duly received back and will be distributed for sowing in 1937 kharif season.

In West Khandesh, the Village Improvement Committee had sanctioned last year a sum of Rs. 500 on the understanding that sann seed would be sold to cultivators at a concession rate of 75 per cent. of the actual cost. Accordingly, 28,400 lbs. of seed were distributed amongst 112 cultivators for growing in the Kharif season of 1936.

In Nasik, sann green manuring is practised in irrigated areas of Sinnar Niphad and Nasik talukas. This is, however, being introduced on the Girna canal where 2,137 lbs. of seed were distributed. In Kolaba, the quantity given out was 905 lbs.

Artificial Fertilizers and Oil Cakes.—The Imperial Chemical Industries have organised a network of agencies all over the division and they effect very large sales of commercial fertilizers amongst which Sulphate of Ammonia is the most widely sold. The Taluka Development Associations are their distributors in several places and through them 163,920 lbs. of Sulphate of Ammonia was sold in East Khandesh, 275,176 lbs. in West Khandesh, and 276,598 lbs. in Nasik. In Thana, 17,920 lbs. and in Kolaba, 1,983 lbs. were distributed. Besides, some quantity of this fertilizer was sold by other local distributors. The use of oil cakes is made for irrigated crops and dry crops of cotton. The quantity distributed largely through the Taluka Development Associations were 396,790 lbs. in East Khandesh, 128,416 lbs. in West Khandesh, and 388,570 lbs. in Nasik. In Kolaba, 3,591 lbs. were supplied.

Common Salt.—Advantage of the concession for denatured salt for manure continued to be taken by owners of cocoanut and mango orchards. During the year under report, permits for 1,204 maunds in Thana, 414 maunds in Kolaba and 714 maunds in Bombay Suburban districts were issued. Figures for the three years are 625, 1,020 and 2,532 maunds respectively.

SUPPLY OF SEEDS OF IMPROVED VARIETIES OF CROPS.

COTTON.

Banilla Cotton.—The Khandesh (Banilla) cotton seed multiplication and extension scheme financed by the Indian Central Cotton Committee, Bombay, completed its sixth year of working. As stated on page 64 of last year's report, the talukas of Pachora, Chalisgaon and Malegaon, were dropped from the area of operation and were replaced by Chopda, Shahada, Nandurbar and Sindkheda in the Tapti Valley.

The total quantity of seed distributed for the 1936 crop was, 823,260 lbs. to suffice for 32,930 acres, of which 9,883 acres were under inner and outer reserved areas. A beginning to distribute seed through the Purchase and Sale Union, West Khandesh, Dhulia, was made and 102,570 lbs. of seed were given out. This is included in the foregoing figure of seed distribution.

In the wilt zone, the Taluka Development Associations, Jalgaon and Bhusaval, distributed 77,228 lbs. of Banilla seed sufficient for 3,089 acres.

Out of this quantity, 11,253 lbs. were obtained from the Government Farm, Jalgaon.

The total estimated area under Banilla cotton in Khandesh was 66,000 acres, of which 32,885 acres were under Departmental seed, and the rest covered by natural spread.

It has been decided to close down the Banilla Scheme as a new cotton superior to Banilla, in staple and highly resistant to wilt has been evolved, and found suitable for the Khandesh tract. This new cotton is the selection N.V. 56-3 and is now named "JARILA". A scheme for the multiplication of Jarila Cotton Seed has been launched from May 1937. Even then distribution of Banilla seed will not be altogether given up, until sufficient seed of Jarila cotton becomes available. The pure Banilla seed produced on Bhadgaon Farm and in the group of villages in Amalner and Shirpur has been stocked from the Director's Personal Ledger Account to the extent of 242,230 lbs. Besides, local merchants have stocked 81,430 lbs. of seed for the 1937 crop.

Surat 1027 *A.L.F. Cotton.*—Gujarat cotton is grown in Nawapur and parts of Nandurbar and Taloda of West Khandesh. In Taloda, 3,445 lbs. of seed of this improved variety were distributed.

WHEAT.

The improved wheats under distribution are (1) No. 224, (2) No. 168, (3) No. 808 and (4) Pusa No. 4. The policy of multiplying seed through successive stages as outlined in the previous report was continued. Private seed farms were given a subsidy of Rs. 2 per acre for undertaking that they would rogue their crop and preserve the seed for distribution to registered seed growers.

Wheat No. 224.—This is being spread in East Khandesh. 7,119 lbs. of pure seed from Jalgaon Farm was given to 12 Private Seed Farms for an area of 118 acres. Registered Seed Growers were given 63,207 lbs. of seed sufficient for 1,137 acres and 138,708 lbs. were issued for general cultivation. The area estimated under this wheat, including natural spread was 7,000 acres. The areas in the previous two years were 2,500 and 2,000 acres.

Seed distributed in 1935-36 from the sum of Rs. 2,000 received from the District Village Improvement Committee, East Khandesh, was fully recovered and re-issued to cultivators in September 1936, on condition of return with 12 per cent. premium. This has also been recovered.

Wheat No. 168.—Distribution of this wheat was continued in West Khandesh. 8,657 lbs. of pure seed from Jalgaon Farm was given to six Private Seed Farms for 143 acres. Registered Seed Growers received 48,825 lbs. of seed sufficient for 814 acres. For general cultivation, the quantity distributed was 187,000 lbs. The total estimated area under this wheat was 6,500 acres including natural spread. The total area in the previous two years was 500 acres and 2,100 acres.

The District Village Improvement Committee, West Khandesh, has set aside a sum of Rs. 750 for subsidising distributors of pure seed at Rs. 1-8-0 to Rs. 2 per map of 720 lbs. The amount debited to this account was Rs. 114.

Wheat No. 808 (*Bansipalli*).—This wheat is distributed in Nasik District. 4,320 lbs. of seed obtained from Niphad and Jalgaon Farms was given to six Private Seed Farms sufficient for 72 acres. 10,841 lbs. of seed sufficient for 205 acres was given to Registered Seed Growers. 24,648 lbs. enough for 410 acres were given out for general cultivation. The total area under this wheat was about 8,000 acres, including natural spread as against 1,500 acres and 600 acres in the preceding two years.

The observation recorded in the previous two annual reports that this wheat is more susceptible to damage by cold winds was corroborated again this year. During this year, it was also damaged by rust to varying degrees. The susceptibility to rust was, however, less than that of the local. The grain has, therefore, been shrivelled and smaller in size.

Pusa Wheat No. 4.—Distribution of this variety was continued in irrigated areas of three districts of East and West Khandesh and Nasik. 2,720 lbs. of pure seed obtained from Karnal and Bhadgaon Farms was distributed to ten Private Seed Farms in Khandesh districts sufficient for 31 acres. The quantity of seed given to Registered Seed Growers was 15,271 lbs. sufficient for 191 acres. Under general distribution 25,634 lbs. were given out to suffice for 321 acres in East Khandesh and 13,936 lbs. for 174 acres in West Khandesh and 41,556 lbs. for 326 acres in Nasik. The total estimated area was 13,426 acres of which the greater portion was in Nasik. In the preceding two years it was 9,340 acres and 8,850 acres.

Akola Bajri.—Considerable spread of this variety has taken place and locally produced seed is used by people in all the three districts. A small quantity, however, is obtained annually from Akola tract for multiplication.

Maldandi Jowar.—This has been under distribution in West Khandesh for four years as a rabi crop. But as it matures later by about a fortnight its spread is not taking place rapidly. During the year only 228 lbs. of seed sufficient for 26 acres was obtained from Sholapur. 6,750 lbs. of locally grown seed enough for 844 acres was distributed for general cultivation. The area under this variety was estimated at 2,330 acres including natural spread. Last year, the area was about 1,700 acres.

In East Khandesh, Maldandi jowar seed was distributed in Ghat portion of Chalisgaon taluka to the extent of 2,880 lbs. for 360 acres.

Nialo jowar.—An earlier variety from Gujarat by name Nialo has been under trial for the last three years. This matures 15 days earlier than the local, the grain however, is smaller with less lustre. 256 lbs. of fresh seed was given to registered seed-growers sufficient for 32 acres, and 728 lbs. for general cultivation. The estimated area was about 200 acres.

RICE.

The varieties under distribution are K.42 and K.226 as late Kolamba rice types, K.540 is an intermediate type, K.184 as an early type and K.412 for highly fertile late rice fields. Pure seed is multiplied at the Rice Research Station, Karjat, and the seed multiplication farm. The area of these being only 14 acres, the demand for farm seed cannot be fulfilled, especially so in years of late rains which spoil the grain and make it unsuitable as seed. The seed from Karjat is given out to private seed farms and first-class registered seed growers in Thana and Kolaba. The crop on these farms is rogued either departmentally or by the owners themselves.

*K.*42.—This is a popular variety in Kolaba and south Thana. 7,000 lbs. of seed was sent out from Karjat to suffice for 200 acres on private seed farms. The quantity given to second-class registered seed growers and under general distribution was 16,398 lbs. to suffice for 138 and 330 acres respectively. The general Kolamba rice crop in Karjat, Panvel and Pen of Kolaba and Kalyan of Thana is largely of this variety and the present arrangement of multiplication of pure seed in two stages in the district is meant for improving the purity of the whole crop.

*K.*226.—This has been under distribution in North Thana. As reported last year its progress has been checked by the introduction of the Surti-Zinia type by the trade. During the year under report 630 lbs. of pure seed of K.226 from Karjat was given out to private seed farms for 18 acres. 3,996 lbs. were distributed to second-class seed growers and 5,764 lbs. were for general distribution. The total estimated area including natural spread under this variety was 7,000 acres.

*K.*540.—This strain has grown into popularity in North Thana. 440 lbs. of pure seed from Karjat was given out for 12 acres on private seed farms and 3,898 lbs. to second-class seed growers for 112 acres. The quantity distributed for general crop was 14,292 lbs. sufficient for 408 acres. The total estimated area under this strain was 1,850 acres including the natural spread. This strain is also spreading in Kolaba and there were about 100 acres under it during the year under report.

*K.*184.—This early strain of Kolaba rice has spread more in North Thana. 205 lbs. of pure seed from Karjat was given out to private seed farms. The second-class registered seed growers received 894 lbs. and 2,666 lbs. were distributed for general cultivation. The total area under this was estimated at 1,100 acres including the natural spread.

*K.*412.—This has only a limited application and 602 lbs. of pure seed from Karjat was distributed.

The District Village Improvement Committee, Kolaba, had sanctioned a sum of Rs. 400 for stocking of rice seeds for distribution. This amount proved very helpful.

IRRIGATED CROPS.

Sugarcane.—The varieties of sugarcane under distribution are CO.290, E.K.28, and H.M.320. Variety CO.290 is a high yielding, early and

fairly frost-resistant cane and is suitable for conditions in Nasik and Khandesh sugarcane tracts.

15,670 whole canes, out of which 8,670 were given out from the District Village Improvement Committee grant and 7,000 from the Departmental grant during last year were again issued on Kadva Canal to 20 cultivators in 19 villages for further spread. Similarly 14,100 whole canes of CO.290 variety of which 8,000 departmental and 6,100 from Nasik District Village Improvement grant were distributed in Malegaon, Baglan and Chandor talukas. The total spread of this variety in Nasik District is estimated at 275 acres including natural spread.

In Sakree Taluka of West Khandesh 13,800 whole canes of CO.290 variety were distributed from the funds of the District Village Improvement Committee on the system of their return with 10 per cent. premium. In addition, 12,000 canes were distributed by cultivators. This was the third year of the spread and about 35 acres were under it.

The taste of gul of this variety however, is saltish and on this account it fetches less price. This is going to be a limitation for its further spread.

8,000 canes of East Khandesh variety were distributed during the year. The area under this cane now is 30 in addition to 90 acres on the Ravalgaon Sugar Farm, while H.M. 320 which is a chewing cane has spread to 100 acres naturally especially in Nasik Taluka.

Wider planting, top-dressing with fertilisers, Poona furnace and improved cane crushers are items of improvement that are being advocated. Wider planting was taken up on an area of 150,250 and 300 acres in the last three years. Top-dressing was done on 400,550 and 800 acres in these three years. 23 Poona furnances and 4 multiple furnaces were constructed during this year. In Shahada of West Khandesh, sugar was prepared with the help of the department with the open pan method for the first time in this district.

Fodder crops.—The crop of lucerne has been extending rapidly and during the year 1,431 lbs. of its seed was distributed in East Khandesh, 7,043 lbs. in West Khandesh and 10,211 lbs. in Nasik. The demand in Nasik was particularly more on account of fodder scarcity following the drought during the kharif season. Similarly, 6,015 lbs. of maize seed, 500 lbs. of nilwa jowar and 840 lbs. of sundia jowar were distributed. The Revenue Department gave special tagavi for fodder crops and the District Agricultural Association, Nasik, offered to pay transport charges on the seed. This amounted to Rs. 104.

DEVELOPMENT OF TAIL-WATER VALLEYS.

As reported on page 70 of last year's report, a beginning for the development of irrigation farming on the banks of three rivers, Patalganga, Kundalika and Pej-Ulhas receiving tail-water from the Tata Hydro-Electric Power houses was made from the amount of Rs. 4,500 received from the District Village Improvement Committee, Kolaba.

The pumping plant fitted up at Kasap on the Patalganga worked from January 1937 onwards and four cultivators grew vegetable crops in an area of 8 acres with chilies occupying 5 acres. They were assisted by a special mali in the technique of truck gardening. Under the scheme, expense on the oils for the engine were incurred by them while the driver was paid from the grant. More applications have been received for irrigation farming under this plant for next year. Another effect of successful working at Kasap has been that the cultivators from other villages are applying for similar facilities and if further funds are received they will be used in setting up new plants. Under the Rahat at Vayal $1\frac{1}{4}$ acres were grown under vegetable crops.

The Karalevadi vegetable farm on the Pej continued to work and the Balsad Rahat was fitted up at Neral on the Ulhas on the farm of Mr. Raje from the Village Improvement grants. He grew about $1\frac{1}{2}$ acres under vegetables and has planted 60 mango grafts and 200 lemon plants. This would be a good centre for demonstration in future.

On the Kundalika 4 Balsad Rahats were purchased and are awaiting erection. A private 20 acre irrigation farm was started during the year on this river by an Agricultural Graduate Mr. Bhaskare and he is being given technical advice and help. He has fitted up an oil engine and pump.

The other immediate facility needed for the development of these valleys is roads for quick transport of produce. The Road Committee, Kolaba, has recommended the construction of a road in each of the the Patalganga and Pej-Ulhas valleys.

FRUIT CULTURE.

The area under fruit orchards is increasing throughout the division. In East Khandesh, 108,905 plants of citrus varieties, 2,100 mango grafts, 66 chiku grafts, 145 pomegranate plants, 30 seedless guava seedlings and 1,300 Meharun bor buds were distributed with the help of the Taluka Development Associations.

The District Village Improvement Committee, East Khandesh, had sanctioned a sum of Rs. 1,500 last year for the improvement and extension of fruit orchards. From this fund a mali was engaged to assist the people in horticultural operations. He budded 1,898 jambori plants with buds of santra and mosambi, pruned 3,600 wild bor trees and budded 1,800 plants. He likewise grafted 520 mango plants and pruned 2,650 citrus trees and 1,720 grape vines. The re-planting of 3,600 jambori seedlings in seed-beds, re-potting 350 mango seedlings and getting 1,000 plants raised also occupied his time. Besides, he treated 93 santra and mosambi plants against stem borer and 208 against gummosis.

In West Khandesh, 5,507 plants of citrus varieties, 658 mango grafts and 1,105 guava plants were distributed and 2,558 bor trees were budded with the help of the Taluka Development Associations. The Horticultural Sub-Overseer of the department who has been stationed at

Dhulia works in both East and West Khandesh. He visited 43 orchards for advisory work, helped in selection of 25 new sites, laid out 8 orchards, budded 280 jambori and 28 bor shoots and helped in grafting 3,071 mango plants. He also helped in treating 500 plants against stem borer attack and supplied 12,000 paper bags for protecting citrus from fruit fly and moth.

In Nasik 1,081 mango grafts, 435 santra and mosambi plants, 112 Italian lemons and 20 sour lemon plants, 25 seedless guava plants and 50 chiku plants were supplied with the help of the Taluka Development Associations. 934 Meharun bor buds were obtained and also budded on wild bor trees.

From the funds of Village Uplift Committee, Nasik, two nurseries have been started. These are at the school of Agriculture and Rural Vocations, Nasik and Central Prison Farm. Here. 150 mango grafts; 32 Italian lemons, 10 pomegranates, 21 mosambi, 20 seedless guavas, 20 chiku grafts and 21 grape fruit plants have been planted. The grafting and budding work would be commenced as soon as the plants grow to some size.

In Thana, the District Village Improvement Committee has sanctioned an amount of Rs. 1,750 for development of Varkas lands by raising plantations of fruit trees on them. A mali has been entertained for helping the people in the technique of fruit farming. This man grafted 502 country mango trees with quality mango varieties and 350 bor trees with quality bor. He also got 2,675 stones sown for transforming them into quality mangoes by grafting *in situ* and attended to the layering of 808 chiku plants and 186 lemon and papnas plants. Under this scheme 166 mango grafts were likewise sold at half price and 233 lbs. of cashew-nut seed, 8 lbs. kokum seed and 850 seeds of jack fruits were also distributed.

In Kolaba, the District Village Improvement Committee had sanctioned an amount of Rs. 1,500 for the development of varkas lands and Rs. 500 for nurseries. The mali entertained from this allotment carried out the operation of side-grafting on 523 country mango trees and converted them into quality varieties, laid out mango orchards at 6 places and prepared 175 approach grafts and carried out budding operations on 118 wild bor trees. He likewise showed the method of planting pine-apples and collected orders for mango grafts and other fruit plants. 458 mango grafts were sold at half price. Similarly, orders for 800 mango grafts, 1,200 pine-apple suckers, 500 lemon layerings, cashew-nut seeds 10,000, 118 bor buds, 36 chiku seedlings, 25 seedlings of seedless guava and 12 cocoanut plants were collected till the end of May 1937 and nearly 75 per cent. of these were carried out.

IMPROVED IMPLEMENTS.

Three more depots of implements were started by the Taluka Development Associations in Khandesh making the total number 46. In these, the number of ploughs kept for hire was 671 as against 597 of last

year. The amount of hire realised was Rs. 3,125. Three departmental depots were closed down. 192 iron ploughs and spare parts worth Rs. 1,316 were sold by the Taluka Development Associations. 132 iron mots and 7 Balsad Rahats were purchased by the people and 40 pumping plants were erected of which Jalgaon Taluka alone had 20. Three Rotary Hand Chaff-cutters were distributed. In Sakree taluka 125 iron crushers and 125 Poona gul pans have been kept for hire by private agencies.

In Nasik, the fifteen implement depots continued to work. Of these 10 belonged to Taluka Development Associations. The number of ploughs in the 10 depots was 529 as against 554 of last year. These depots also keep iron crushers, Poona gul pans, gul moulds etc. The amount of hire realised was Rs. 3,758. The amount of hire on ploughs in departmental depots was Rs. 303. In addition, there are several agencies which keep implements on hire. The district staff supplied 64 iron ploughs and spare parts worth Rs. 803, 22 iron mots, 12 sugarcane mills and 60 bajri sieves.

CONTROL OF PESTS AND DISEASES.

Betelvine Wilt.—The District Village Uplift Committee, Thana, has granted a sum of Rs. 750 spread over three years for combating this disease in Bassein tract. From this amount, 9 sets of wooden tubs and 18 water cans were purchased and given out on hire for preparing Bardeaux mixture. These were used by 59 cultivators. Nine demonstration plots were arranged in the concentrated tract of Bassein and 8 demonstrations given. People were explained the life-cycle of the fungus and the theory of control in 7 small classes. 300 lbs. of each of copper sulphate and lime were distributed free. Out of 500 acres under betelvine, people adopted the treatment on about 100 acres. The progress is rather slow on account of the cost involved in the treatment as also its laborious process. In Mahim tract, 3 demonstration plots were arranged and practical assistance in treating the vines was constantly given.

Mango-hoppers and Mildew.—Ten dust guns, two ladders and extension tubes purchased last year from the funds of District Village Improvement Committee, Thana, were used during the year under report. The method of dusting sulphur on trees and blossoms was demonstrated at 8 places and 1,618 trees were dusted. In Kolaba, 300 trees were dusted and 5 dust guns were sold. The weather in February proved very disastrous and the mango blossom shed heavily.

Observations on the effect of Cirrus dust which was tried as a substitute for sulphur as it became unavailable due to Abbysinian war, showed that it was rather harmful to the mango blossom.

Gummosis and Stem borer.—The number of citrus trees treated against gummosis in Khandesh was 2,400 and that against stem borer 375. In localities where this has been demonstrated in the past the people adopt the method themselves and need no help.

Rats on wheat.—In Khandesh, rats appeared sporadically on wheat in January and February 1937. Their destruction was demonstrated by means of cyno-gas fumigation in rat burrows and hiding places in cracks of fields. The measure was effective and further spread was controlled. Seven cyno-gas pumps and 70 lbs. of cyno-gas A dust were supplied to the people. The process of control was demonstrated at 6 places.

Wild-pig Campaign.—Reference has already been made on page 76 of last year's report to the first gun-club formed in East Khandesh in Bhusaval taluka at Salsingi village and to the subsidy of Rs. 500 granted by the District Village Improvement Committee, East Khandesh. There were 10 villages that joined the club and organised 90 hunts in four months. 106 pigs and 29 blue-bulls were killed and an equal number was wounded. The Shikar Officer, Poona, gave considerable technical help and attended the hunts himself on several occasions. The Mamlatdar of Bhusaval Mr. G. V. Bhagwat took great interest in this work from the beginning in organising and seeing that the club worked satisfactorily. The total expenditure amounted to Rs. 600 on ammunition and wages and it was estimated that damage to crops worth Rs. 30,000 was saved. Three more gun-clubs were organised in a compact block of about 20 miles by 10 miles adjacent to the Salsingi group and their working was commenced from the 9th of May 1937.

The Raver Taluka Development Association maintains two Shikaries for the destruction of wild pigs. During the year under report it spent Rs. 341 on this activity and killed 142 wild animals.

SHOWS, DEMONSTRATIONS AND CLASSES.

Classes.—Three classes, in which theoretical and practical training in subjects of agricultural importance was given, were held for the benefit of adult cultivators. The first of these was at Palghar under the auspices of Taluka Development Association, Palghar, from 6th to 13th September 1936. This was attended to by 200 cultivators from the taluka. The Taluka Village Improvement Committee made free lodging and boarding arrangements, for 50 cultivators. Another class was held for 8 days at Mohide village in Shahada taluka in Khandesh in December 1936 under the auspices of the Taluka Development Association, Shahada. The chief object of the class was to give training in oil-engine and pumps as there are about 16 pumping plants in this single village and the owners needed education in their upkeep and repairs. Lectures and demonstrations on agricultural and horticultural subjects were also given. Sixty adult cultivators attended it regularly. One more class was held at Yeola for three days in March 1937 to train the district staff of the department and the Taluka Development Associations in the technique of prevention of soil erosion. Twenty-two members attended this class. This was a long-felt necessity as the subject has been receiving special attention in this division.

Village-Improvement Publicity Van.—This Van visited the districts of Nasik, West Khandesh and East Khandesh for a period of 118 days from 18th February 1937 to 15th June 1937. The number of halts of the van was 84 and an intensive programme of agricultural demonstrations and lectures was drawn up. The local Agricultural Overseers who accompanied the van throughout the period actively participated in carrying it out. At every centre of halt an agricultural stall was put up. Similarly decent cattle shows were organised at many of the centres. One of the most attractive features of the programme was that bunding and ploughing competitions were arranged and prizes were awarded. The period was really one of great interest and liveliness among the masses.

Shows and Demonstrations.—During the year under report no large scale district show was organised in the division. Demonstrations were, however, held on Government Farms at Jalgaon, Bhadgaon and Dhulia. At Kusumba in West Khandesh a Cattle Show was organised on 9th December 1936, at the time of the visit to Dhulia of the Honourable Sir D. B. Cooper, then Finance Member to Government.

In addition to these, small demonstrations on various items of improvements were arranged on extensive scale and the following table shows their particulars.

Table showing the details of demonstrations.

Kind of demonstration.	East Khandesh.		West Khandesh.		Nasik.		Thana.		Kolaba.	
	No.	Attendance.*	No.	Attendance.*	No.	Attendance.*	No.	Attendance.*	No.	Attendance.*
1	2	3	4	5	6	7	8	9	10	11
(1) Crops ..	144	3,720	60	1,820	73	1,870	51	2,650	16	2,210
(2) Manures ..	91	1,800	52	1,460	24	901	6	600	10	150
(3) Implements ..	189	3,310	116	6,400	59	1,031	2	300	3	30
(4) Control of pests and diseases.	337	8,660	74	2,200	88	1,333	27	575	11	250
(5) Magic lantern ..	9	3,700	21	8,000	6	3,000	11	1,100	..	..
(6) General demonstration.	40	2,250	15	2,500	51	6,428	..	..	1	700
(7) Cattle shows ..	2	1,000	..	..	..	..	..	..	1	700
(8) Agricultural shows	31	3,400	..	..	..	..	..	..	..	..
(9) Fair demonstrations.	11	6,500	5	2,000	8	6,500	..	..	..	..
(10) Gul-making ..	..	..	..	..	18	400	..	..	..	..
(11) Van demonstrations.	30	10,400	20	10,000	31	13,000	..	..	..	..
(12) Anti-erosion ..	1	100	..	..	21	400	..	..	..	..
(13) Canning of fruits	..	..	..	..	..	..	3	100	..	..
Total ..	885	49,840	363	34,380	379	41,363	100	5,325	42	4,040

*The attendance is approximate.

There were thus 1,769 demonstrations held and were attended by about 136,000 people.

INFORMATION SERVICE.

The members of the District Staff in the division continued to contribute useful articles to the Marathi magazines " Shetki and Shetkari " and " Gramodhar " and to the English and Marathi papers " Times of India ", "Dnyan-prakash", " Vijya ", " Kolaba-samachar ", etc., and the total number contributed was 48 as against 38 of the last year.

The Taluka Development Associations continued to contribute for the copies of " Shetki and Shetkari " for free distribution to the village leaders and school teachers with a view that they should read them out to the people. The total number of copies was 858. The District Staff and the fieldmen of the Associations also read out important articles and other important literature at village chavdies at their night halts for the benefit of illiterate cultivators.

The departmental staff supplied 25 copies of the book "आमची शेती", 25 of "फळझाडाचा बाग" , 2 of "कलमी आंब्याची व्यापारी लागवड" and 78 bound volumes of the departmental leaflets. A large number of leaflets continued to be widely distributed. Mr. K. G. Kolhatkar, B.Ag., District Agricultural Overseer, Malegaon, has prepared an index to articles in the magazine " Shetki and Shetkari " for the first 25 volumes.

TALUKA DEVELOPMENT ASSOCIATIONS.

There was no change in the number of Taluka Development Associations this being 20 in Khandesh, 5 in Nasik, 3 in Thana and 2 in Kolaba. In addition to these 4 un-registered agricultural associations at Kalvan, Chandor, Nandgaon and Sinnar noted in the report of the last year continued to function. These non-official bodies are a great asset for the promotion of improvement in agriculture. The large amount of useful work done by these bodies has been mentioned under various sections in the preceding pages of the report and a consolidated statement showing the extent of their activities and the financial position is given in Appendix I.

The Jalgaon, Jamner and Shirpur Taluka Development Associations continued to run their cattle breeding farms. The work of the poultry and goat sections at the Gilligan Cattle Breeding Farm which received Rs. 1,900 as subsidy from the Village Improvement Funds as referred to in the last year's report progressed well. Besides, an oil-engine and pumping and chaff-cutting plant were installed at this farm from the amount of Rs. 3,500 received from Village Improvement Funds. This has made it possible to grow irrigated crops on a large scale at the farm. The Jamner and the Shirpur Associations are making special efforts to improve their cattle farms by growing their fodder crops. Among the other Associations, the Shahada Association was conspicuous by organising an oil engine and pumping class and by taking a keen interest in the

work of the Crop Protection Society at Shahada and making preliminaries for starting more such societies. The Nandurbar Association has shown all round progress. The Raver Association has continued to carry on the pig-killing campaign whereas the Edlabad and Bhusaval contributed Rs. 200 and Rs. 100 each respectively towards the organisation of gun-clubs. The Malegaon and Yeola Associations undertook the activity of anti-erosion work while the Satana, Ozar and Yeola Associations did excellent all round work. The Dahanu Association is also showing good progress specially by organising grain depôts and extending the cultivation of the rabi crops like val, gram, castor, etc.

DHULIA AGRICULTURAL SCHOOL.

Fifty applications for admission into the school were received out of which 15 were selected. The total number of students on the roll were 30 out of which 15 were in the first year and an equal number in the second year.

The flori-horticultural section and the school poultry farm have now been considerably developed. Compost making has been made routine practice on the school. The boys have maintained a reading room and the facilities for games have been provided. During the year under report an additional facility of weekly visit by the Government Sub-Assistant Surgeon, Dhulia, has been provided for the benefit of the students.

The Local Agricultural School Committee received Rs. 2,334 as contribution from the Sir Sassoon David Trust Fund, Local Boards, Municipalities and the Taluka Development Associations and spent Rs. 1,743 for stipends to students, etc. The balance with the Committee amounts to Rs. 4,378 at the close of the year. The Committee deserves thanks for the continued interest which it has taken. During the year under report a constitution of this Committee has been framed on representative basis.

The school farm continued to act as a primary stage for multiplication of improved varieties of crops. 1,875 of Banilla cotton seed, 152,080 lbs. of groundnut, 235 lbs. of Pusa wheat No. 4, 400 canes of CO. 290 variety and other miscellaneous seeds and suckers were distributed.

The annual function of demonstration of crops and school activities was held on 6th October 1936 under the auspices of Taluka Development Association, Dhulia, when about 200 cultivators attended.

REGULATED COTTON MARKETS.

Dhulia Cotton Market.—This market completed its seventh season of working. It continues to work efficiently and enjoys the confidence of both the cultivators and the buyers.

The total number of carts arrived this year was 34,978 of seed cotton, 2,190 of lint and 282 of waste cotton up to the end of May 1937 as against 56,087, 1,554 and 424 carts respectively of the last year. The difference

in the arrivals is due to the failure of cotton crop on account of acute drought in Sakree Taluka and its adjoining tract and to rather high production of cotton last year. The malpractice of bringing waste cotton to Dhulia for mixing with good cotton continues. The number of disputes settled this year was 267 out of which only 8 appealed to the Dispute Sub-Committee.

Financially too, the market's position is sound. During the season the receipts amounted to Rs. 8,716 and the expenditure of the financial year to Rs. 6,450. The Market Committee has at present Rs. 19,923 in cash balance in addition to immovable property worth Rs. 5,500. The work of acquiring a site for the Market has been in progress.

Amalner Cotton Market.—This is the second cotton market in Khandesh. It has completed its third year of working, during the year under report. 21,531 carts of seed cotton, lint and waste cotton arrived in the market. The net receipts amounted to Rs. 3,950 as against an expenditure of Rs. 2,475.

The work of starting two more markets—one at Dondaicha in West Khandesh and the other at Jalgaon in East Khandesh—is in progress.

IMPROVEMENT OF POULTRY.

With the help of funds (Rs. 750) from the Village Uplift grant the poultry section at the Vernacular Agricultural School, Dhulia, was extended. The average number of birds per month at this section was 29 hens, 7 cocks, 25 cockrels, 9 pullets and 114 chickens and 416 hatching eggs and 112 small and grown up cockrels and pullets of White Leghorn breed were given out from it. A major portion of this stock has ben supplied to the backward Bhil cultivators in Taloda.

In East Khandesh, poultry farms have been started at each of the Gilligan and Gangapuri Cattle Breeding Farms and were subsidised at Rs. 300 each from Village Improvement Funds. 100 eggs, 92 pullets and 23 cockrels of White Leghorn and 20 eggs, 40 pullets and 12 cockrels of Rhode Island Red were distributed from the Varangaon and Pachdevali private poultry farms in Bhusaval Taluka.

In Nasik, a poultry farm was started at the School of Agriculture and Rural Vocations from the Village Improvement grants. There are two breeds maintained, viz. White Leghorn and Rhode Island Red, and there were at the end of the year 24 hens, 12 cocks and 134 chickens. The District Staff gave out 114 eggs and 8 hens of White Leghorn.

In Thana, the poultry section at the Bordi School was subsidised to the extent of Rs. 400. In Kolaba, a poultry section was started at the Karjat Farm from the grant of Rs. 750 from the Village Improvement Funds. At the end of the year there were 8 hens, 6 cocks, 13 pullets and 21 chickens of three breeds suited to the locality. The District Staff distributed 53 hatching eggs and 17 cocks, obtained from the Visapur Jail Poultry Farm.

The object of all these poultry centres is to multiply pure improved breeds for supply of hatching eggs and cocks to cultivators in the respective districts.

RURAL UPLIFT.

Grants received for agricultural schemes from Village Improvement Funds from each of the 5 districts in the division have been reported on page 80 of last year's report. The actual work carried out from these grants during the year under report has also been described under various sections in the preceding pages. It may, however, be summarised here as below :—

East Khandesh.—35,381 lbs. of seed of improved wheat No. 224 and 1,440 lbs. of Pusa wheat No. 4 were distributed on the system of return at harvest with 12½ per cent. premium. 14,400 lbs. of sann seed for green-manuring wheat fields was distributed on similar system. Soil erosion was prevented on an area of 230 acres in Jamner and Bhusaval Talukas and bunds on an area of 150 acres were got repaired. 2,886 cart-loads of compost manure was got prepared on 41 farms and 24,404 lbs. of bones were charred for easy crushing for manuring purposes. 1,800 wild bor plants were budded with Meharun bor buds, 2,650 citrus trees and 1,720 grape vines were pruned, root exposture was demonstrated in 32 gardens, 520 mango plants were grafted, 93 citrus trees were treated against stem borer and 208 against gummosis. Crops of the estimated value of Rs. 30,000 were saved from wild pigs and blue bulls on account of shikar work. New herds of cows and bulls of Nemar breed were given to each of the Gilligan and Gangapuri Cattle Breeding Farms and also a subsidy of Rs. 500 to each of them for the maintenance of animals. Subsidies of Rs. 1,000 and Rs. 300 were also given to the Gilligan Cattle Farm for the goat and poultry sections. Out of the total amount of Rs. 14,450 sanctioned for the foregoing agricultural schemes, the expenditure so far has been Rs. 10,555. The amount of Rs. 2,000 for wheat seed is to turn over annually.

West Khandesh.—53,993 lbs. of improved wheat No. 168 and 1,065 lbs. of Pusa 4 wheat were distributed and the distributors are to be subsidised at the rate of Rs. 1-8-0 per *map* of 720 lbs. 28,400 lbs. of sann seed was given out at 75 per cent. of cost price, for green manuring. 506 acres were protected against soil erosion. 13,800 sugarcanes of the C0. 290 variety were issued on the system of return after harvest with 10 per cent. premium. Rs. 750 were paid as subsidy to the poultry farm at the Vernacular Agricultural School, Dhulia ; two poultry houses were given to cultivators. 480 mango grafts were given out for nurseries. Out of the total amounts of Rs. 7,305 the expenditure incurred so far is Rs. 3,092.

Nasik.—A school of Agriculture and Rural Vocations was developed on the estate of Udaji Maratha Boarding, Nasik. The area was protected against erosion and fertilised by adding sann-green manure. Roads and wire fencing were constructed and an area of 10 acres developed with mango and citrus plantations. A poultry section was started and

there are in all 218 birds of White Leghorn and Rhode Island breeds. A nursery has been started at the Nasik Road Central Prison Farm. 14,050 sugarcane of Co. 290 variety, 660 of E. K. variety and 700 of H. M. 320 variety were distributed. In Yeola Taluka 2,215 acres of land was protected against soil erosion. Out of the sum of Rs. 13,500, the expenditure incurred so far is Rs. 7,819.

Thana.—Nine sets of tubs for preparing Bordeaux Mixture and 18 water cans have been stocked at Bassein to assist cultivators in the control of betelvine wilt disease. Ten dust guns with 2 ladders and extension tubes have been stocked for lending to owners of mango orchards for dusting the trees against hoppers and mildew. Rs. 400 were given as subsidy to the poultry farm of the Bordi school. Two stud bulls were located at Mokhada and Mandve in Vada. A mali was entertained for assisting in horticultural operations; 502 country mango trees were grafted and 302 bor trees were budded by him; a nursery was started at Worle in Vada and 294 lemon and chiku layers were likewise made. 166 mango grafts were sold at half price and 223 lbs. of cashew-nut seed, 8 lbs. of kokam seed and 850 seeds of jack fruit were distributed. The total amount sanctioned for agricultural schemes was Rs. 5,350 and the expenditure so far has been Rs. 2,752.

Kolaba.—On the Patalganga river 8 acres of vegetable crops were grown by four cultivators under the irrigation water of the pumping plant installed from the Village Improvement Funds at Kasap and 1¼ acres under the Balsad Rahat at Vayal. One Balsad Rahat has been fitted up at Neral on the Ulhas river and four Balsad Rahats have been purchased for the Kundalika river. For varkas land development a mali was entertained and he operated 523 country mango trees by side-grafting, laid out mango orchards at 6 places and prepared 175 approach grafts. 118 wild bor trees were budded and 458 mango grafts were sold at half price. Orders for 800 mango grafts, 1,200 pine apple suckers, 500 lemon layerings, 200 Italian lemon plants, 10,000 seeds of cashew-nut, 36 chiku layers, 25 seedlings of seedless guava and 12 pomegranate plants were secured and nearly 75 per cent. of these were fulfilled till the end of May 1937. A poultry farm has been started at Karjat Rice Research Station for supply of cocks and eggs of improved breeds. 53 eggs of White Leghorn and Rhode Island Red were sold. Out of the amount of Rs. 10,250, the total expenditure so far has been Rs. 7,455.

HIS EXCELLENCY THE VICEROY'S CATTLE IMPROVEMENT SCHEME.

His Excellency the Viceroy's appeal for donation of stud bulls of renowned breeds for the improvement of cattle in the country side received good response in this division and the Collectors of the various

districts have received promises and amounts for purchase and maintenance of bulls as shown in the following table :—

District.	Promises.			
	Cash.	No. of bulls to be purchased.	In kind bulls.	For maintenance.
1	2	3	4	5
	Rs.			Rs.
(1) East Khandesh ..	19,250	75	3	2,907
(2) West Khandesh ..	11,295	42	18	1,539
(3) Nasik	4,175	18	12	748
(4) Thana	4,379	8	10	1,313
(5) Kolaba	2,303	10	2	471
(6) Bombay Suburban ..	4,108	14	1	1,020
Total ..	45,510	167	46	7,998

District.	Realisations.				
	Cash.	No. of bulls to be purchased.	In kind bulls.	For maintenance.	No. of bulls located.
1	6	7	8	9	10
	Rs.			Rs.	
(1) East Khandesh ..	9,750	39	..	2,207	21
(2) West Khandesh ..	2,646	11	..	151	10
(3) Nasik	1,275	7	1	677	1
(4) Thana	3,679	7	3	1,038	9
(5) Kolaba	2,303	10	..	471	3
(6) Bombay Suburban ..	4,108	14	1	1,020	4
Total ..	23,761	88	5	5,564	48

The first bull to be located was from the "Times of India" at Ozar on the Kadva Canal on 14th July 1936 at the hands of Mr. Perry, Collector of Nasik. Thirteen bulls were presented at a special ceremony at Jalgaon

by the Collector while 8 were presented at the hands of Sir D. B. Cooper, then Finance Minister to Government, at the Gilligan Cattle Breeding Farm, East Khandesh, on 11th January 1937 at the time of his visit there.

ACKNOWLEDGMENTS.

In concluding this report I have great pleasure in acknowledging the assistance given by the Collectors of the five districts in this division by allotting liberally towards the various agricultural schemes from the Village Improvement funds. Mr. Murlidhar Nathubhai Gujrathi, Vice-President of the Taluka Development Association, Yeola, gave considerable help to the anti-erosion campaign by personal practice and precept for which he deserves thanks. Mr. G. B. Kane, B.Ag., Mamlatdar of Niphad, pushed on with vigor the sulphur treatment against jowar smut, planting of mango grafts, bor budding and poudrette making by the system of trench latrines. He also collected a sum of Rs. 5,100 for the starting of a Khilar Cattle Breeding Farm. Mr. G. V. Bhagwat, Mamlatdar of Bhusaval, gave help in the organisation of the Gun-club at Salsingi while Mr. N. B. Chaudhari, Mamlatdar of Taloda, arranged to get donations for 10 Khilar bulls in the taluka. Mr. R. K. Deshpande, Mamlatdar of Amalner, was very helpful in the spread of Banilla cotton and in guiding the work of the Regulated Cotton Market at Amalner. Khan Bahadur Shaikh Mohiuddin Shaikh Vazir, B.Ag., District Deputy Collector, Kalyan Prant, took great interest in His Excellency the Viceroy's Gift Bull Scheme and got several donations in the Bombay Suburban District when he was there and further in Kalyan Prant.

Special mention must be made of Mr. S. V. Shevade, L.Ag., who retired as Cotton Superintendent, Khandesh, on 7th March 1937 for his enthusiastic hard work in organising the Regulated Cotton Market at Amalner and for the able steering of its work in the capacity of the Chairman of the Market Committee in its initial two years.

K. V. JOSHI,
Deputy Director of Agriculture,
N. C. D., Nasik.

NASIK :
2nd August 1937.

Statement showing the information of the Taluka Development Associations in the North Central Division, for the year 1936-37.

Serial No.	Name of the Taluka Development Association.	Total Actual receipts.	Total Actual Expenditure.	Government Subsidy.	Main Activities.		
					Number of plots arranged.	Number of Demonstrations held.	Quantity of seed sold and distributed.
1	2	3	4	5.	6	7	8
	Nasik District.	Rs.	Rs.	Rs.			Lbs.
1	Nasik	842	842	302	41	13	228
2	Ozar-Tambat ..	2,323	2,422	100	79	15	..
3	Yeola	1,643	1,748	800	28	95	40,572
4	Malegaon	2,877	4,836	530	42	46	108,730
5	Satana	2,050	2,870	360	35	17	12,220
	West Khandesh.						
6	Dhulia	2,255	2,055	000	5	18	47,428
7	Sakri	1,757	1,844	800	12	40	37,583
8	Sindkheda	1,411	2,370	600	50	5	58,052
9	Shahada	1,274	1,345	620	43	10	57,842
10	Taloda	2,082	1,153	272	30	11	142,660
11	Nandurbar	1,702	1,774	594	19	16	34,367
12	Shirpur	1,092	2,777	800	12	50	20,135
13	Nawapur	1,208	475	1,000	5	..	3,334
	East Khandesh.						
14	Jalgaon	5,394	6,090	000	116	52	112,099
15	Bhusawal	3,338	3,773	000	100	72	30,428
16	Raver	3,844	2,537	000	49	104	10,130
17	Yawal	2,773	2,494	410	60	49	7,750
18	Edlabad	1,378	1,054	578	20	40	1,540
19	Amalner	2,275	1,047	455	35	73	31,053
20	Chalisgaon	..	..	387	49	190	5,030
21	Chopda	2,823	3,044	800	22	109	11,175
22	Erandol	2,822	2,383	649	15	120	62,725
23	Pachora	2,151	2,906	1,450	45	26	29,122
24	Parola	3,586	1,473	1,000	19	65	80,354
25	Jamner	6,655	5,639	1,000	21	24	2,025
	Thana District.						
26	Dahanu	510	935	218	45	57	10,000
27	Palghar	1,206	2,568	140	9	8	11,727
28	Umbergaon	230	362	325	9	11	6,300
	Kolaba District.						
29	Roha	..	..	209	..	..	..
30	Mahad	760	547	100	12	7	..

Serial No.	Name of the Taluka Development Association.	Main Activities—*contd.*				
		No. of plants and seedlings sold and distributed.	Quantity of manure or fertilizers sold.	No. of implements sold.	No. of implements kept for hire.	Total hire charged on implements.
1	2	9	10	11	12	13
	Nasik District		Lbs.			Rs.
1	Nasik	171	....	....	7	20
2	Ozar-Tambat ..	47	282,704	1	31	1,077
3	Yeola	255	39,424	295	106	197
4	Malegaon	342	92,262	583	404	909
5	Satana	30	138,543	390	70	1,334
	West Khandesh					
6	Dhulia	1,150	78,563	3	47	190
7	Sakri	2,436	52,348	6	32	80
8	Sindkheda	428	94,472	5	26	121
9	Shahada	4,375	1,09,238	....	10	31
10	Taloda	....	1,588	....	5	4
11	Nandurbar	165	38,437	1	19	110
12	Shirpur	138	23,296	....	46	28
13	Nawapur	86	....	....	....	....
	East Khandesh					
14	Jalgaon	2,887	291,236	41	40	436
15	Bhusawal	6,425	35,300	30	52	297
16	Raver	4,200	28,620	11	34	249
17	Yawal	4,395	36,808	31	48	456
18	Edlabad	3,893	3,700	18	20	67
19	Amalner	31,100	24,256	16	38	120
20	Chalisgaon	640	23,760	1	38	125
21	Chopda	2,153	26,410	4	37	291
22	Erandol	2,994	23,841	3	28	136
23	Pachora	1,105	14,684	....	35	197
24	Parola	1,245	62,308	2	48	227
25	Jamner ..	10,900	40,640	21	80	991
	Thana District					
26	Dahanu	....	....	....	....	....
27	Palghar	887	....	....	....	....
28	Umbergaon	....	....	....	....	....
	Kolaba District					
29	Roha	....	....	.....	....	....
30	Mahad	....	....	....	....	....

K. V. JOSHI,
Deputy Director of Agriculture,
North Central Division, Nasik.

ANNUAL PROGRAMME OF WORK, 1937-38.

North Central Division.

RESEARCH.

Jalgaon Farm—

(1) Comparative yield trials of the promising Verum Strains.

(2) Further study of wilt-free cotton cultures, with intensive study in the families of N. V. 56-3 with a view to isolate highly wilt resistant or wilt-immune races.

(3) Spacing experiments with Jarila cotton.

(4) Comparative yield trials of the promising strains in Aispuri Jowar.

(5) Trials of Sann-green manuring for wheat.

(6) Seed multiplication of Jarila cotton and wheat strains Nos. 168 and 224.

(7) Further trials to improved seed-drills.

Bhadgaon Farm—

(1) Selfing and multiplication of pure seed of Jarila cotton for distribution in Khandesh and replicated trials of new cotton selections.

Dhulia Agricultural School Farm—

In addition to providing facilities for training in agriculture, horticulture, floriculture and truck gardening, Jarila cotton trials would be conducted in replicated plots.

Karjat Farm—

(1) Multiplication of pure seed of improved varieties of K. 226, K. 540, K. 184 and K. 42 for distribution in the district.

(2) Multiplication of pure seed of improved Nagli strains, B. 11 and E. 31 for distribution in the district.

(3) Further replicated trials of castor and safflower cakes as manures for rice.

(4) Multiplication of cocks of the improved breeds of poultry for distribution in the district.

(5) Running a poultry section for supply of improved cocks.

AGRICULTURAL SERVICE AND PROPAGANDA.

(1) *Land Development.*—Further propaganda and technical advice in the methods of protecting land from soil erosion by bunding and terracing.

(2) *Maintenance of Soil fertility.*—Popularising the method of preparing compost from farm refuse, sann-green manuring and use of bone meal and oil cakes.

(3) *Extension of improved varieties of crops.*—Arranging for the multiplication and distribution of wheat strains Nos. 168, 224, Pusa 4 and 808, Akola bajri, Maldandi Jowar, Rice strains Nos. K. 224, K. 42, K. 184 and K. 540 ; sugarcane E. K. 28, and H. M. 320.

(4) *Trial of improved varieties of crops.*—Maldandi and Nialo jowars, Rice strain No. 540 and Surti Zinya ; Jarila Cotton and Castor Strain No. 20.

(5) *Trial of new crops.*—Tobacco on varkas lands in Thana and Kolaba districts.

(6) *Trials of implements.*—Further trials of Sayan harrow, improved seed-drills, winnowing fan, wheat thresher, etc.

(7) *Extension of improved implements.*—Iron ploughs, scrapers, Poona gul pans and furnaces, power cane crushers, iron mhots and power pumping plants.

(8) *Control of pests and diseases.*—Further work of organising gun-clubs for protection of crops from wild pigs and blue bulls in Khandesh. Propaganda for sulphur treatment on jowar for smut, Bordeaux Mixture on betelvine wilt disease in Mahim and Bassein tract, sulphur dusting against mango hoppers, creosote against gummosis, destruction of stem-borer in fruit trees, fumigation of ant hills and rat burrows.

(9) *Horticulture.*—Propaganda in planting the fruit trees of economic value such as mango, lemon, bor, cashewnut, etc., on varkas lands in Thana and Kolaba districts. Popularising the planting of quality-mangoes and bor and arranging for the supply of reliable grafts and buds and budded plants. Encouraging the starting of fruit nurseries. Horticultural advice on improvement of fruit gardens.

(10) *Cattle Improvement.*—Location and Record keeping of Gift-bulls under His Excellency the Viceroy's Scheme of Cattle Improvement.

(11) *Miscellaneous.*—Organization of regulated cotton markets at Dondaicha in West Khandesh and Jalgaon in East Khandesh. Popularising irrigation farming in Tail-water Valleys in Kolaba and Thana districts.

(12) *Village Uplift.*—Development of the School of Agriculture and Rural Vocations at Nasik, development of fruit nurseries at the Central Prison Farm, Nasik Road, supply of improved seeds in Khandesh, technical help in horticulture, tree planting, terracing fields, compost making, bone crushing and manure pits. Improvement of poultry by subsidizing poultry farms and supply of cocks of improved breeds. Improvement of cattle by subsidising cattle farms and supply of breeding bulls. Assistance in control of crop diseases and pests as in Bassein for betelvine wilt and mango hoppers in Thana district. Improvement of Varkas lands and development of Tail-water Valleys in Thana and Kolaba districts.

K. V. JOSHI,
Deputy Director of Agriculture,
North Central Division, Nasik.

Nasik, 1st September 1937.

APPENDIX D.

Summary of work done under the Deputy Director of Agriculture, South Central Division, Poona, for the year 1936-37.

Staff.

I held charge of the Office of the Deputy Director of Agriculture, South Central Division, Poona, throughout the year under report and like last year, continued to be the nominee of the Government to represent Agriculture on the Local Advisory Committee of the G. I. P. Railway. I was also a member of the Irrigation Conference.

Mr. S. B. Jadhav, B.Ag., who acted as Divisional Superintendent of Agriculture, Deccan Canals, Baramati, throughout the last year, continued to act in the same post till 28th August 1936 when he was relieved by Mr. G. P. Patil, who was acting as Professor of Agricultural Economics. Mr. S. B. Jadhav again acted as Divisional Superintendent of Agriculture, Deccan Canals, Baramati, from 28th November 1936 to 18th May 1937 during which period Mr. G. P. Patil was appointed as Acting Deputy Director of Agriculture, N. D., Gujarat, Surat.

Mr. G. L. Patil, who was on long leave from 1st January 1936, joined duty on 24th December 1936 and after working for a short period as District Agricultural Overseer, Kopergaon, proceeded on deputation to Kolhapur State for two years, from 19th March 1937. Mr. Peter Rahater, Mechanical Assistant, S. C. D., retired on pension with effect from 1st April 1937. The control of Mechanical Section was transferred to the Agricultural Engineer to Government, from 1st April 1937. Mr. H. C. Patil, the District Agricultural Overseer, Satara, who was on leave, was transferred to Pandharpur to work as District Agricultural Overseer, Pandharpur, and Mr. S. G. Futane, who was temporarily posted to Satara from 26th April 1936, continued to work as District Agricultural Overseer, Satara.

Lines of Work.

The work of this Division is summarised under the following headings: —

(1) Season.

(2) Research.

(3) Propaganda.

(4) Agricultural Organization :—

(*a*) Taluka Development Associations.

(*b*) Non-credit Societies.

(5) Agricultural Services.

(6) Miscellaneous.

Section I.

Season.

In the Deccan, monsoon started rather late, with few showers which were not sufficient for the sowing of kharif crops. In the month of July, a moderate rainfall was received and the sowing of cotton and bajri was started, but there was a long drought in the month of August, which was very harmful to the young crops; and in Ahmednagar, Sholapur and part of Poona, the kharif crops had to be grubbed up. In Satara District, however, sufficient rainfall was received in the western part; while in the eastern talukas of Satara District, very little rain was received. Thus it may be said that the kharif crops were almost a failure in the major portion of the Deccan. In the month of September 1936, moderate rain was received and the sowing of rabi crop was started, but there was again a long break in October, which stunted the growth of the rabi crops. Fortunately, sufficient rains were recorded in the month of November 1936, which revived the growth of the rabi crops. On the whole it may be said that the kharif season of 1936–37 was very unsatisfactory, while the rabi season was somewhat better. In the Ratnagiri District, although the total rainfall was below normal, it was fairly well distributed and hence nearly 8 to 11 annas rice and nagli crops were harvested. During this year, there was a great scarcity of fodder and a large number of cattle was disposed off by the cultivators. Most of the cattle were purchased by butchers while a small number was sent to the forest for grazing. Hardly 20 per cent. of these cattle must have returned to their villages, as they suffered very badly from Diarrhœa and for want of fodder. This was a very bad year for cattle and the total number of cattle must have been reduced by 50 per cent. Government have provided liberal Tagai grant and baled grass to several needy cultivators which saved the situation to a greater extent.

Section II.

Research.

Kopergaon Farm.

Area.—The total area of this Farm is 110 acres and 19 gunthas. Out of this area 60 acres of land is leased to the Banilla Cotton Scheme of the Indian Central Cotton Committee. About 10 acres is under buildings, gurhal house and yards and farm roads. About 4 acres of land is lying uncultivable waste being chopan and water-logged, and the rest is under experiments of the Farm proper. During the year, the single cropped area amounted to 34 acres and 20 gunthas, while double cropped amounted to 6 acres and 30 gunthas.

Object.—The chief object of this farm is to demonstrate the improved varieties of sugarcane and rotational crops, economical methods of growing sugarcane and confirmation of results of experiments obtained on the Padegaon Research Station.

Season.—The total rainfall during the year amounted to 19 inches and 15 cents. The rainfall up to November was in light showers spread over a very long period, thus minimising its utility. The total amount from June to October was 11 inches and 92 cents with 39 rainy days, while the November showers only amounted to 7 inches and 93 cents with 9 rainy days. The rains were scanty and insufficient for kharif season and late for the rabi season.

The following experiments were conducted on this Farm :—

I. Trial of cane varieties.
II. Nitrogenous requirements of cane.
III. Diversification in cane farming.
IV. Adsali cane cultivation.
V. Padegaon Series.
VI. Miscellaneous Experiments :—
  A. Trial of *Phaseolus Trilobus* as a green manure crop.
  B. Trial of Sorghum hybrids.
  C. Trial of groundnut varieties.
  D. Trial of cotton varieties.
VII. Banilla Cotton Scheme.

I. *Trial of Cane Varieties.*—Five varieties were tried in four replicates and the following table gives the average results :—

Plant Cane.

Yield per acre.

Name of variety.	Weight of cane.	Weight of gul.	Extraction.	Brix.	Gul to cane.	Age of crop at harvest.
	Lbs.	Lbs.	Per cent.			M. d.
Striped D. 109 ..	92,300	11,620	66·12	19·20	12·59	14 0
E.K. 28 ..	81,994	11,024	66·77	22·31	13·50	14 0
P.O.J. 2878 ..	74,848	9,852	65·0	22·20	13·33	13 6
Pundia ..	78,036	10,016	67·87	19·66	12·86	14 14
Co. 290 ..	80,456	10,288	65·17	20·89	12·79	13 3

Ratoon Cane.

Yield per acre.

Name of variety.	Weight of cane.	Weight of gul.	Extraction.	Brix.	Gul to cane.	Age of crop at harvest.
	Lbs.	Lbs.	Per cent.			M. d.
Striped D. 109 ..	44,036	5,464	65·81	20·20	12·38	12 0
E.K. 28 ..	58,172	7,688	66·60	21·63	13·20	11 23
P.O.J. 2878 ..	69,580	9,655	65·06	22·05	13·88	11 14
Pundia ..	65,668	8,436	68·50	19·96	12·81	12 25
Co. 290 ..	88,256	11,820	65·19	21·52	13·38	11 24

P. O. J. 2878 has stood last in plant cane just as last year. This shows that to obtain higher yields, the planting of this variety will have to be done earlier. The variety arrows early and fully. As usual P. O. J. ratoon has given better yields. Striped D. 109 has given better yields as plant cane, but stands last in ratoon. Except Pundia and E. K. 28, the quality of gul in other varieties is inferior.

II. *Nitrogenous requirements of cane—*

Top-dressing of 100 lbs. N., 150 lbs. N. and 200 lbs. N., per acre, were tried on E. K. 28 variety. The following are the results of both plant and ratoon cane :—

	Plant cane.		Ratoon cane.	
	Yield per acre.		Yield per acre.	
	Cane Wt. in lbs.	Gul Wt. in lbs.	Cane Wt. in lbs.	Gul Wt. in lbs.
100 lbs. N.	71,292	9,552	82,820	10,828
150 lbs. N.	96,576	12,840	78,832	10,340
200 lbs. N.	96,288	12,586	97,188	12,480

The results this year are varying with those of last year and hence not decisive.

III. *Diversification in cane farming.—*

FIRST SERIES—*Figures per acre.*

Crop.	Yields per acre in lbs.	Value of product.	Cost of cultivation.	Net profit or loss.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Sann (Green Matter) ..	11,840	447 13 0	434 15 0	+12 14 0
Cane (Gul)	11,196			
Ratoon Cane	Not taken	as Pundia is a bad Ratooner.		
Bajri Grain	681	24 5 0	27 13 6	+5 12 0
Fodder	1,858	9 4 6		
Gram (Grain) ..	501	15 13 0	17 2 0	— 1 5 0
Wheat	1,084	67 12 0	40 4 0	+27 8 0

SECOND SERIES.

Crop.	Yield per acre in lbs.	Value of product.	Cost of cultivation.	Net profit or loss.
		Rs. a. p.	Rs. a. p.	Rs. a. p.
Sann (Green Matter) ..	11,840	327 13 6	430 14 6	—113 1 0
Plant cane	8,196			
Ratoon cane	Not taken	as Pundia is a bad Ratooner.		
Cotton	689	63 9 0	49 15 0	+13 10 0
Jowar Grain	1,788	55 14 0	54 3 0	+11 0 0
Fodder	1,844	9 5 0		

Wheat has been introduced this year in place of Tobacco.

IV. *Adsali Cane Cultivation—*

A trial of the three varieties E. K. 28, P. O. J. 2878 and Pundia was continued. The following are the results :—

October harvesting—(Yield per acre).

Name of variety.	Cane Wt. in lbs.	Gul Wt. in lbs.	Extraction.	Brix.	Gul to Cane.
			Per cent.		
E. K. 28 ..	79,576	9,240	61·87	18· 0	11·58
P. O. J. 2878 ..	1,15,848	13,248	63· 0	19·08	11·40

Pundia was not ready for harvest in October 1936.

December harvesting—(Yields per acre).

Name of Variety.	Cane Wt. in lbs.	Gul Wt. in lbs.	Extraction.	Brix.	Gul to Cane.
			Per cent.		
E. K. 28 ..	74,144	8,928	65·06	18·53	12·01
P. O. J. 2878 ..	1,22,716	14,516	63·43	19·77	11·82
Pundia ..	63,632	6,664	65·25	16·48	10·44

November harvesting could not be undertaken owing to the erection of the new cane crushing plant. The ratoon of the October harvesting is maintained. Last year the hailstorm had vitiated the experiment and there was no ratoon cane for harvest this year.

P. O. J. 2878 seems most suitable for planting as Adsali crop.

V. *Padegaon Series—*

Series A.—A trial of Co. 360 and P. O. J. 2878 is conducted in six replicates. The ratoon of the last year's crop was maintained. The following are the results :—

Name of variety.	Plant Cane. Average yield per acre.		Ratoon Cane. Average yield per acre.	
	Cane Wt. in lbs.	Gul Wt. in lbs.	Cane Wt. in lbs.	Gul Wt. in lbs.
Co. 360	98,016	11,876	78,150	9,187
P. O. J. 2878	85,246	10,323	82,576	10,567

The results show the superiority of Co. 360 over P. O. J. 2878 in plant cane. But in ratoon, the P. O. J. 2878 gives better yields.

Series B.—H. M. 89, E. K. 28 and Pundia are tried in four replicates. The last year's ratoon is also maintained.

Name of variety.	Plant Cane. Average yield per acre.		Ratoon cane. Average yield per acre.	
	Cane Wt. in lbs.	Gul Wt. in lbs.	Cane Wt. in lbs.	Gul Wt. in lbs.
H. M. 89	65,655	7,820	40,780	4,900
E. K. 28	78,070	10,010	54,715	6,850
Pundia	73,015	9,205	54,715	6,850

The results of H. M. 89 are poor and therefore, this series is being dropped from next year.

Series C—New varieties from Padegaon.—This year a new variety, viz., Co. 419 was received from Padegaon Farm, and planted on this Farm in two plots of ten gunthas each. A ten guntha crop was harvested for

securing the data of yields and the other was disposed off for seed purposes. The following are the results of harvesting :—

Yield per acre.

Variety.	Cane Wt. in lbs.	Gul Wt. in lbs.	Extraction.	Brix.	Gul to cane.	Age of crop at harvest.
			Per cent.			Months Days.
Co. 419 ..	91,108	10,808	64·62	19·92	11·86	12 16

The other ten guntha plot, supplied as seed, yielded 45,750 sets for the area. The calculated cane weight in this area per acre amounts to 1,06,746 lbs. The variety produced an excellent quality of gul. The ratoon of this variety is very vigorous and it is a very promissing variety.

VI. *Miscellaneous Experiments—*

A. *Phaseolus Trilobus as a green manure crop.*—The trial was continued this year with a no manure plot. The following are the results :—

Yield per acre.

	Grain in lbs.	Fodder in lbs.
Jowar after Ran Matki	952	1,456
Jowar (Check, without manure)	844	1,172

The yield of *Phaseolus Trilobus* was 16,320 lbs. per acre green matter and Nitrogen contents were 0·39 per cent. This season was most unfavourable for green manure crop for want of rains.

B. *Trial of Sorghum Hybrids.*—Co. 352 and Co. 356 were planted in February and June this year and the following are the results of the two different plantings :—

February planting—(Yields per acre).

Name of variety.	Weight of cane in lbs.	Weight of gul in lbs.	Extraction.	Brix.	Gul to cane.	Age of crop at harvest.
			Per cent.			Months Days.
Co. 352 ..	67,648	7,816	64·38	18·98	11·56	10 3
Co. 356 ..	55,584	6,816	60· 0	19·18	12·24	10 3

June planting—(Yields per acre).

Name of variety.	Weight of cane in lbs.	Weight of gul in lbs.	Extraction	Brix.	Gul to cane.	Age of crop at harvest.
			Per cent.			Months Days.
Co. 352 ..	60,072	6,040	55·8	20·44	10·06	9 24
Co. 356 ..	64,664	6,368	59·8	16·66	9·94	9 24

The February planted cane arrowed fully in November, while there were no arrows to the June planting.

C. *Trial of Groundnut varieties.*—The two strains, viz., K-1 and K-3 mentioned in the last year's report, were maintained, as they were found promising. They were sown on a field scale and the following are the yields :—

Name of variety.	Area under the variety.	Date of sowing.	Period of growth days.	Average yield dry pods in lbs.
	A. g.			Per acre.
K-1	9 0	22nd June 1936.	121	1,424
K-3	1 0	21st June 1936.	103	2,099
Sp. Peanut	18 20	20th June 1936.	115	1,174

A plot of K-1 variety after Adsali cane yielded 1,700 lbs. of dry pods per acre. This year the weather was adverse for growth of the crop and therefore, the yield in general is low in all cases. The results of analysis of the above varieties are as under :—

	Kernals.	Oil.	Shell.
	Per cent.	Per cent.	Per cent.
K-1	71	48·90	29
K-3	77	48·20	23
Sp. Peanut	81	51·5	19

D. *Trial of cotton varieties.*—Banilla Cotton was tried with Co. 2, N. V. 56·3 and N. V. 57·7 in four replicates. The following are the average results :—

Name of variety.	Date of dibbling on ridges.	Date of 1st picking.	Yield in lbs. per acre.	Ginning.	Staple length.
				Per cent.	
Banilla ..	1st May 1936 ..	15th September 1936.	554	40·0	15·16 m.m.
N. V. 56·3 ..	Do. ..	Do. ..	460	36·4	20·21 m.m.
N. V. 57·7 ..	Do. ..	Do. ..	447	33·5	20·21 m.m.
Co. 2 ..	Do. ..	20th October 1936.	318	34·3	22·23 m.m.

The N. V. varieties were badly attacked by a black fungus, destroying the developed bolls and also by borers in the early stage.

VII. *Banilla Cotton Scheme—*

This is the third year of the Banilla Cotton seed distribution scheme, conducted with the help of the Indian Central Cotton Committee. Pure Banilla Cotton seed is supplied to the Deccan Canals area. This year 31 acres and 20 gunthas were under cotton and 28 acres and 20 gunthas were under groundnut. The average yield of seed cotton amounted to 678 lbs. per acre while that of groundnut amounted to 1,286 lbs. per acre. The cotton was ginned on the Farm and 8,875 lbs. of pure Banilla Cotton seed was supplied to the registered seed growers. The yields of both crops were poor this year, owing to scanty rains, adverse weather conditions and diseases. The total expenditure under the scheme during the year amounted to Rs. 4,601-10-3. The three years' figures for expenditure and receipts are as follows :—

	Rs.	a.	p.
Expenditure	14,112	8	0
Receipts	14,425	1	2

The outstanding bills still due to be recovered amount to Rs. 257. This shows a margin of Rs. 570 as net profit at the end of the third year.

VIII. *Machinery—*

18 BHP Hindustan Engine and a Hemant Crusher were installed on the farm this year. The engine throughout the season worked satisfactorily. There were some defects in the crusher, causing 2 to 3 per cent. less extraction. These were pointed out to the makers—Messrs. Kirloskar Brothers, Kirloskarwadi—and they have since then supplied new parts embodying the suggested improvements. These will be tested next season.

IX. *Propaganda and Services—*

A. *Hire of Implements.*—The total hire of implements from the farm amounted to Rs. 72-0-6. In addition the Chattanooga No. 92 crusher was given on hire and realised Rs. 150.

B. *Crushing cane of cultivators.*—21¼ acres of cultivators' cane were crushed on the farm plant in addition to the farm work. 540 pans were taken and Rs. 270 realised as hire charges, were credited as receipts.

Mohol Farm.

Season.—The year under report is marked by deficiencies of rain-fall from month to month. The kharif rains were quite insufficient and thus the kharif season was a total failure. August rains which are generally good in amount were scanty resulting late sowing. Rainfall after sowing being insufficient, especially in the young stage of the plant and there being less water in the soil, the crop suffered most in shallow soils.

Due to precautions taken for conservation of moisture the farm crops did not suffer much from drought as on cultivators' fields. The average yield on the farm for 43 acres comprising of various types of soil was 367 lbs. of grain and 1,088 lbs. of kadbi fodder. The maximum outturn on good soil was 1,017 lbs. of grain and 2,080 lbs. of kadbi fodder per acre, while the minimum was 94 lbs. of grain and 808 lbs. of fodder per acre. It will thus be seen that in a famine year, the average was pretty good.

The following experiments were conducted on this farm during the year under report :—

(1) Dry farming Experiments.
(2) Jowar Breeding Experiments.

(1) Dry Farming Experiments—

These experiments were in continuation of last year's experiments. The beneficial effects of dry farming treatment were never so visible as last year, which was most trying for crops. The conservation of moisture was greater in plots receiving the improved treatment than the cultivator's plot. The treatment and yield were as below :—

Yield per acre.	Treatments.		
	Ploughed.	Harrowed.	Cultivator's method plot.
	lbs.	lbs.	lbs.
Grain	660	515	339
Fodder	1,431	1,235	574

(2) JOWAR BREEDING EXPERIMENTS—

Maldandi.—Four Maldandi strains, viz., 35-1, M-9, 47-3 and 31-2 were tried against local, graded and rejected seed in Fisher's randomised block system with seven replications and one guntha plot for each strain within a block. The average yield figures are as below :—

Name of strain.	Average of yield per plot of one guntha.	Calculated yield of grain in lbs. per acre.	Remarks.
	Lbs.	Lbs.	
35-1	28·10	1,124·00	
47-3	25·97	1,038·80	
M-9	26·21	1,048·40	
31-2	26·83	1,073·20	
Local	23·59	943·60	
Graded	23·50	940·00	
Rejected	23·71	948·40	

Standard error of the experiment is 2·007 and the standard error for comparison of two varieties mean is 1·07. After working out the figures for Z test, it is found that the experiment is significant and within the varieties compared. 35-1 stands as the best, high yielding strains. All the strains show significant superiority over local.

If the relative position of Maldandi strains for the last four years for different characters, viz., yielding capacity, earliness and grain size, are compared, it will be seen that strain 31-2 stands high as regards yielding capacity but other two characters, viz., grain size and earliness, it is not good. The main peculiarities and behaviour of these strains for the last four seasons, i.e., 1933 to 1936, are worth noting from the following statement :—

Strain No.	Yield per Guntha.				Earliness.			
	1933	1934	1935	1936	1933	1934	1935	1936
35-1	13·14	19·84	9·63	28·10	Early.	Early.	Early.	Early.
47-3	15·27	17·49	9·90	25·97	Late.	Late.	Late.	Late.
M-9 ..	16·28	20·35	8·25	26·21	Medium.	Medium.	Medium.	Medium.
31-2	13·46	21·02	11·38	26·83	Late.	Late.	Late.	Late.
Local (check) ..	15·95	15·26	9·27	23·59	Mid-mixture.	Late.	Mid-late.	Mixture.

Out of these strains, 35-1 looks to be very very promising as it is not only early but it has better grain size and yielded higher even under drought conditions as of last season.

Valuation of jowar strains.—In order to see the comparative prices offered for different Maldandi strains, random samples of grain from the yield trial plots were sent to Mohol Bazar, with the following results :—

Name of strain.	Rate per maund by measure, i.e. 112 lbs. by weight.	Percentage increase or decrease in rate over local (per maund by measure).
	Rs. a. p.	Per cent.
35–1	3 15 0	5
47–3	3 13 6	2½
M–9	3 12 0	On equal level with local.
31-2	3 10 6	—2½
Local	3 12 0	....

District trials of Maldandi strains.—Out of the Maldandi strains, strains Nos. 35-1, 47-3 and M-9 were given on a large scale trial for yield tests on cultivators' fields, in most of the talukas of the Sholapur district, part of Bijapur and Poona districts and a small quantity of seed was also given to Nagar, Satara and Khandesh districts. Briefly it can be stated that strain No. 35-1 is appreciated everywhere as it has high yielding capacity, better grain size and being early, proves its efficiency in drought. Regarding 47-3, it may be stated that, it being slightly late, proves its efficiency where jowar is irrigated. Trials of M-9 on cultivators' fields are inadequate but it may be stated that cultivators feel that it is a better yielder. More trials are necessary.

Yield test of Dagadi Strains.—A yield test as per Fisher's method was arranged wherein the three old Dagadi varieties, viz., N.D.15, B.D. 24 and B.D.34 were tried, against Dagadi Locals. The number of replications was four and the plot size was one guntha. The results are as given below :—

Strain number.	Grain in lbs. per acre.	Fodder in lbs. per acre.
N.D. 15	1,052	3,080
B.D. 24	977	3,090
B.D. 34	1,032	2,720
Local (Bijapur)	1,217	3,520
Local (Nagar)	1,165	3,240

As the means of all the strains are lower than the locals, it is clear that none of the strains are superior to locals. The previous records also show that the yields of Dagadi strains are poor.

New Selection work in Tambdi Jogadi.—22 selections together with 30 new collections were put in duplicate rows and the observations were made on the following characters :—(1) Peduncle length ; (2) Yielding capacity ; (3) Earhead length ; (4) Earhead diameter ; (5) Colour of grain ; (6) Colour of glumes ; (7) Size of grain.

15 selections look to be promising and the yielding capacity will be tried on shallow soils. Along with this segragation for different morphological characters will be continued.

Selection work in Bedri.—Out of the ten selfed earheads from last year, only seven will be taken for detail study.

Ratnagiri Farm.

Season.—The season during the year under report was better than the last year. The beginning of monsoon was quite good but the first fortnight of July having showed an abrupt break in the rains, the transplanting of rice could not be well finished. Those who had the facilities of irrigation completed their transplanting while others had to wait. Nearly 2 per cent. of the upland areas remained fallow for want of sufficient water in the fields. The late rains in November spoiled grass and also harvested rice to some extent. The intermediate and late strains of rice came up very well. The total rainfall during the year amounted to 97·14 inches as against 94·40 inches of the last year. In short, the season was fairly normal.

The farm work comprises of the following :—

(1) Rice Breeding and Selection.

(2) Fruit section and nursery.

(3) Vegetables.

(4) Nagli work at Hatkhamba.

(1) *Rice Breeding and selection.*—The main work of the multiplication of different strains of rice was done as usual. The quantities of seed supplied during the season of 1937 to registered seed growers are as under :—

		Lbs.
Early (coarse) ..	.. Patni No. 6	2,130
Intermediate (medium)	.. Panwel No. 61	3,298
	Waksal No. 207	2,657
Intermediate (fine) ..	.. Kolamba No. 184	413
	Kolamba No. 401	2,130
Late (coarse) ..	.. Bhadas No. 79	475

Kudai No. 25 did not command any sale this year. It seems, farmers are not in favour with this strain. The quantity of seed of this strain kept for distribution was 106 pounds.

The trials of the late Varangal strains were further conducted at Chiplun. Strain No. 487 has maintained its superiority, as it did for the last 2 years, by yielding 11·48 per cent. more grain. The other strains, Varangal Nos. 420 and 448 gave an increase of 8·0 and 3·2 per cent. over the local respectively.

Along with the selection of Varangal strains, the trials of new fine Waksal selections were also conducted at Chiplun. Strain No. 1 has once again proved its superiority by giving 3·09 per cent. increase in the yield over local. One more trial will be given to these strains, Nos. 1, 3 and 27 to arrive at conclusive results.

As regards work on crosses, the selections Nos. 4-1 and 17-23 were grown in F_6 generation during the year, but the former having been found to be splitting considerably, has been rejected. The selection No. 17-23 will, therefore, be grown alone in F_7 generation and watched in all its details.

Selection No. 4-7 which has been set aside to compare its yield with Patni No. 6 has proved again to be superior to the latter by yielding 25·6 per cent. increase in the grain. The selection was, however, found to be attacked by borer. Next year the trial will be given on a large scale.

(2) *Fruit Section and Nursery.*—The introduction of general fruit culture was done at this centre from June 1934. During the year, the Fig has been an addition.

As regards *pine-apple*, there has been a general liking for the cultivation of " Kew " variety rather than " Queen ". The size of the former is twice as big as the latter and hence the income derived from the cultivation of that variety is nearly double from the same area. It is intended to bring as much area as possible under the " Kew " variety on this farm. An income of Rs. 625 was derived by the sale of pine-apple fruits this year as against Rs. 508 of the last year.

Manurial experiments on pine-apple have been taken during the year under report, on behalf of the Imperial Chemical Industries, which contributed towards the expenses of the manure. It is too early to say anything about the results.

Of the different varieties of *guavas*, Lucknow No. 49 and Seedless have been found to be the best. Fruits as big as 1¼ lbs. in weight were harvested from the former variety. The tender growth on the guava plants has been found to be attacked by the Cockcheffer beetles. Guavas have been the quickest to grow and to bear fruit.

Mosambis and *Santras* are progressing quite well. They will bear fruit within a year or two.

Chickoos have shown a very good performance. A few plants have started bearing. The fruits are very tasteful.

As regards *sour limes*, gootied plants have just started flowering. Italian lemons have already given one crop. The fruit is consumed mostly for pickles.

The first year's crop of *banana* from the Basrai and Sonkel varieties have proved beyond doubt their superiority over the local varieties. These varieties command a very good sale in the local market.

Due to late rains in November, *grapes* did not thrive well during the year. Only a few bunches were harvested.

Though *mangoes* had a profuse flowering this year, much of it was damaged by hoppers in spite of the precautionary methods of dusting the trees with sulphur powder. The George variety did not yield any fruit this year. The mango grafts situated on the rockey land on the Hatkhamba farm are not making any progress. Some plants had flowered, but no fruit was obtained. Budding of the mango seedlings in situ has been done. It is to be seen how far it is going to be successful. The unsuccessful plants will be grafted in the ordinary way.

The area under *cashewnut*, which is cultivated on the Hatkhamba farm, is 5 acres. The plants in situ have outgrown and have been in every way superior to the transplanted seedlings. Most of the plants had given inflorescence this year.

The *bor* plants on this farm yielded a bumper crop this year. The fruit has been considered to be far superior in taste and flavour to ghat fruits. In order to introduce bor cultivation on varkas areas, two dozen stumps of country bor have been planted on the Hatkhamba farm in June 1936. The shoots given out to these stumps will be budded with seedless and Mehrun buds.

Nursery.—The experience of the last two years about the sale of nursery plants has indicated great possibilities of the extension of nursery in all its sides. Mango grafts and pine-apple suckers are in the greatest demand. One third of the total farm receipts are made up by the sale of nursery plants. It is intended to increase the stock of Citrus plants next year.

(3) *Vegetables.*—The crops of Brinjals, Chillies, Knolkhol, Cabbage and Bhendi were grown on the farm as usual. Trials were given to tomato, vegetable chillies and cauliflower, to see how far they thrive and command a sale in the local market. It is observed that excepting cauliflower, which has only a limited sale, the other two types could be sold without much trouble. The only difficulty is that the plants of tomato and vegetable chillies begin to wither when they are about to start flowering or soon after they have finished their first picking. The total sale proceeds from vegetables amounted to Rs. 462 as against Rs. 453 of the last year.

(4) *Nagli work at Hatkhamba.*—The multiplication of the improved strains of Nagli—A16, B11, E31, E82 and E44 and E62—was done on the farm as usual. The purity of seed has been maintained by discriminate roughing and bagging enough earheads of each strain. The total quantity of seed distributed to the registered seed growers during the season of 1937 amounted to 1,758 lbs.

Section III.

Propaganda.

The principal items of propaganda are given below :—

(1) *Treatment of jowar seed against smut.*—The propaganda of mixing jowar seed with sulphur dust was carried out on a very large scale and the following packets were distributed during this year :—

Name of the District.	Number of packets sold.	Area estimated under treated jowar.
		Acres.
(1) Poona	1,900	7,000
(2) Satara	5,670	45,376
(3) Ahmednagar	3,968	34,340
(4) Sholapur	25,420	2,54,200
(5) Canal tract	6,338	31,476
Total ..	43,296	3,72,392

The percentage of smutted earheads varied from 1 to 12 per cent. The Collector of Sholapur had taken very keen interest in distributing the packets through the Mamlatdars and the Taluka Development Associations.

(2) *Seed grading.*—This work was continued as usual and the following quantities of seeds were graded before sowing :—

Kind of seed graded.	Poona.	Ahmednagar.	Sholapur.	Satara.	Canal tract.	Total.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Bajri ..	19,335	3,440	..	3,415	2,250	28,440
Jowar ..	43,398	18,345	3,88,268	96,075	25,568	5,69,654
Wheat ..	3,600	4,325	4,000	..	5,820	17,745
Groundnut ..	..	..	3,000	..	..	3,000

(3) *Introduction of new crops and varieties.*—The work mentioned on page 103 of last year's report was further continued. During this year a new variety, viz., Co. 419 was released from the Padegaon Farm and it

was tried in comparison with other varieties, already introduced. This variety appears to be very promising and is quite suitable both for sugar and gul making. Large scale yield trials of Co. 419 will be available next year. The variety Co. 360 was also tried in many places, but it was found, that it lodges very badly and the quality of cane is also inferior. The average yields of several plots are given below :—

Variety.	Yield of gul per acre.
	Lbs.
(1) E. K. 28	13,722
(2) P. O. J. 2878	13,566
(3) Co. 290	12,870
(4) Co. 360	12,447
(5) H. M. 89	13,160
(6) Pundia	10,025

The trial of Co. 360 and P. O. J. 2878 was also conducted in 6 replications and the averages of 12 places are given below :—

Co. 360 .. .. .. 12,990 lbs. of gul per acre.

P. O. J. 2878 .. .. 13,253 lbs. of gul per acre.

During the year under report, the following sets of the sugarcane varieties were distributed on the Deccan Canals, at concession rates :—

Name of the variety.	Number of sets distributed.
(1) E. K. 28	94,550
(2) P. O. J. 2878	17,000
(3) P. O. J. 2883	4,500
(4) H. M. 89	500
(5) Co. 290	30,000
(6) H. M. 320	16,500
(7) Co. 360	81,500
(8) Co. 419	49,500

It will be interesting to note that all the sugar factories are growing new cane varieties according to their requirements and there is not a single acre under Pundia in the factory cane. The total area of sugarcane maintained by the factories is nearly 13,000 acres (excluding overlapping), while the cultivators' area of the new cane varieties may be

little over 5,000 acres (excluding over-lapping). E. K. 28 has occupied a major portion as it is a medium cane and can be crushed with bullock mills. The gul prepared of this variety is fairly good. The P. O. J. 2878 stands second in order and it is adopted by persons who have got power crushers.

During this year, experiments of applying 100 lbs. of $P_2 O_5$ per acre in the form of superphosphate were arranged on the different canals to the sugarcane crop and the results appear to be encouraging. The average yields are given below :—

Treatment.	Yield of gul per acre.	Control.
100 lbs. of $P_2 O_5$	13,857 lbs.	12,979

Difference in yield—908 lbs. of gul.

The cost of this manure per acre was Rs. 21-4-0, while the value of the additional outturn was Rs. 33-12-0, thus bringing a *net profit* of Rs. 12-8-0 *per acre.*

(4) *Introduction of Banilla and Jayawant Cotton.*

(A) *Banilla Cotton.*—The scheme of multiplying Banilla Cotton and the supply of pure seed to the registered seed growers has been mentioned in the summary of the Kopergaon Farm. During this year, 8,875 lbs. of pure Banilla cotton seed was supplied to the registered seed growers for an area of 500 acres. The crop of cotton was not very satisfactory due to the scarcity of rains and want of sufficient water in the canals. The produce of the seed growers' cotton was further supplied to the general cultivators for the area of nearly 5,000 acres. The Department has no control of the seed after the 3rd stage and consequently the exact area covered by the Banilla Cotton is not known, but it is presumed that the total area under Banilla may not be more than 10,000 acres in South Central Division, as several cultivators and Taluka Development Associations order the seed direct from Khandesh. In this connection it should be specially noted that a serious pest of green caterpillar (*Cosmophila Erosa*) is doing damage to cotton crop in its early stage and consequently, the gaps were required to be filled in 3-4 times. This attack reduces the yield to a large extent. Another serious pest was also seen in the attack of Dusky cotton bugs, which bore holes in the seed and thus the germinating capacity is reduced. Wilt was also seen in the cotton fields produced from the seed of Khandesh. These problems will have to be tackled in the near future.

Trials with artificial manures were also made on cotton crops, both in the perennial and 8 months block. In the perennial blocks, the top-dressing of sulphate of Ammonia at the rate of 125 lbs. per acre was more advantageous as the net profit realised after defraying the cost of the

manures, came to Rs. 11 per acre over the control. But in the case of 8 months block, it was not sufficiently remunerative if the cost of F. Y. M. plus Sulphate of Ammonia be taken into consideration. The following are the results :—

I Perennial Block.

Treatment per acre.	Yield in lbs.
	Seed cotton
(1) 25 lbs. of N. from Sulphate of Ammonia	869
(2) Control (No manure)	695

II 8 Months Block.

(1) 20 lbs. of N. from Sulphate of Ammonia plus 10 cart-loads of F. Y. M. ..	805
(2) Control (No manure)	642

(B) *Jayawant Cotton.*—The introduction of Jayawant cotton in Satara District is done for the last 5 years, but the systematic attempt was made during the year under report, on account of special grant received from the Indian Central Cotton Committee. During the year, under report, 13,700 lbs. of seed sufficient for 2,000 acres was distributed in Tasgaon and Islampur Talukas of Satara District, from the Athani Centre. The season was rather unfavourable for the development of cotton and consequently the average yield of Jayawant cotton was about 300 lbs. and the local cotton gave 250 lbs. Open auction sales of the Jayawant and local Kumta cottons were arranged at Sangli, where special arrangement was made to show the comparative difference between the Jayawant and Kumta cottons. The Jayawant cotton was sold at 8·75 lbs. per rupee while the local kumta was sold at 10·25 lbs. per rupee. In all 350 carts of pure Jayawant cotton were sold in this market.

(5) *Groundnut.*—The area under groundnut and cotton is gradually increasing since the price of gul has fallen. The introduction of the new groundnut strains viz. Kopergaon Nos. 1 and 3 is progressing very satisfactorily and the Department was not able to cope up with the demand. During the year under report, nearly 10,000 lbs. of Kopergaon No. 1 and 1,000 lbs. of Kopergaon No. 3 groundnut pods were distributed in this division. The trials were made of the varieties on the 4 canals and the averages of the several experiments are given below :—

Variety.	Yield per acre.
	Lbs.
(1) Spanish Peanut	1,115
(2) Big Japan	1,480
(3) Kopergaon No. 1	1,576

Both Spanish peanut and Kopergaon No. 1 can be harvested within 4 months, while Big Japan requires more than 5 months and consequently the irrigation and harvesting charges are very heavy.

(6) *Akola Bajri.*—The demand for Akola Bajri is still increasing, although some cultivators are undertaking the trial of African bajri. During the year, the reliable Akola bajri seed was not available, due to the failure of kharif crops and hence only 2,640 lbs. of seed was supplied. The trials of local, Akola and African bajri were made in several places both as an irrigated as well as dry crop and the results are given below :—

Name of the place where the trial was made.	Yield per acre.						Remarks.
	Local.		Akola.		African.		
	Grain.	Fodder.	Grain.	Fodder.	Grain.	Fodder.	
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
Sangamner ..	1,313	2,568	..	..	1,601	3,493	Irrigated.
Akola ..	591	1,462	..	..	1,437	3,575	Do.
Shevgaon ..	272	1,111	..	..	120	4,720	Dry.
Newasa ..	264	999	299	1,184	..	..	Do.
Akola ..	132	251	180	404	..	..	Do.
Bhatkalwadi ..	420	..	560	..	..	..	
Devrashtra ..	576	..	768	..	..	..	Dry.
Malegaon ..	540	..	..	..	1,860	..	Irrigated.
Gardi ..	576	..	..	..	864	..	Do.
Vita ..	375	..	..	..	300	..	Dry.
Karad ..	222	..	..	..	207	..	Do.
Dahiwadi ..	800	..	..	..	1,920	..	Irrigated.
Pimpri ..	496	..	560	..	1,068	..	Do.
Mandavgaon ..	528	..	..	..	1,120	..	Do.
Mirajgaon ..	550	..	610	..	1,144	..	Do.

From the above results it will be seen that the African bajri has given better results wherever the crop was irrigated and it has failed to compete even with local bajri in the dry tract. Further it is doubtful how far, the fodder of African bajri will be relished by cattle.

(7) *Wheat Strains.*—As stated on page 107 of the last year's report, Pusa wheat (No. 4 and No. 111) were ordered in small quantities for

replacing the old deteriorated wheat, similarly the strain in No. 808, evolved at Niphad was also sent for trial. All these strains were tried with local varieties and the results are summarised below :—

Locality.	Yield per acre in lbs.				Remarks.
	Pusa No. 4.	Pusa No. 111.	Local.	No. 808.	
N. L. B. Canal ..	628	659	693	..	Irrigated.
N. R. B. Canal ..	404	439	..	..	Do.
Godavari Canals ..	723	627	787	549	Do.
Pravara Canals ..	738	781	368	..	Do.
Koregaon	1,536	..	950	..	Do.
Satara	480	..	380	..	Dry.
Man	425	..	400	..	Do.
Vita	606	..	570	..	Do.
Talegaon	1,800	..	670	..	Irrigated.
Do.	720	..	640	750	Do.
Shivapur	600	..	420	..	Dry.
Shevgaon	587	..	173	..	Do.
Newasa	660	..	560	..	Do.
Parner	..	..	83	363	Do.
Shevgaon	..	..	325	385	Do.
Sangamner	..	..	283	332	Do.

During this year the attack of rust was not very severe ; consequently, the local wheat has also given fairly good outturn.

(8) *Improvement of Rice.*—In the Ratnagiri District, the improved strains of rice viz. Patni 6, Panwel 61, Bhadas 79, Waksal 207 and Kolamba Nos. 184, 401, 42 and 512 were supplied to several Registered seed growers through the Taluka Development Associations. The areas suitable for different strains have now been fixed and the cultivators in the different tracts are satisfied with these strains on account of their increased yields. In all 12,350 lbs. of the seed of the rice strains were distributed amongst 140 registered seed growers for an area of 230 acres. The total yield realised from this area was about 2,50,000 lbs. which was just sufficient for 4,500 acres ; besides there is a very large area under

these strains by natural spread and it is presumed that the total area under improved rice may vary from 15,000 to 20,000 acres in this district. The stock of seed of the Ratnagiri Farm is very limited hence some of the Taluka Development Associations are arranging their own seed-farms for the supply of pure seed to the Registered seed growers. Some Associations are also supplying the seeds of rice strains by exchange system, so that the needy cultivators are not required to pay the high cost of these seeds.

The trials of Kolamba 540 were again repeated this year and from the observation it seems that this strain is more suitable for rich fields, as the yield is increased by 50 per cent. over the local variety. In ordinary soils, however, it has not given any substantial yield over the local. In Ahmednagar District, the trials of Kolamba No. 540 and 184 were taken in Akola Taluka along with the local varieties and the results are given below :—

Strain No.	Yield per acre.
	Lbs.
Kolamba 540	920
Kolamba 184	928
Local Raibhog.	796

This year, the crop was very poor for want of sufficient rains.

(9) *Improved Nagli Strains.*—The work of distributing improved strains of nagli was further continued and during the year under report, 2,100 lbs. of pure nagli seed was supplied to 120 seed growers for an area of 220 acres. From this area 80,000 lbs. of nagli seed was produced and it has covered the area of 4,000 acres. Besides there was a large area of these varieties by natural spread. The Taluka Development Associations have also arranged seed farms for multiplication and distribution of the nagli seed.

(10) *Dry Farming.*—The propaganda of convincing the public with the principles of dry farming was done on a wider scale during this year and their advantages were realised by the cultivators in this year of scarcity. In Sholapur District, there was a large area under small bunding, wide sowing, selection of seed by grading and repeated interculturing. Those who have followed this method were able to get 8-10 annas crop while by the ordinary method they could not get even 4 annas crop. The total area under dry farming method may be 5,000 acres in Sholapur, 2,000 acres in Ahmednagar and 2,800 acres in Poona District. The only principle which is not followed by the cultivators is deep ploughing, as this is one of the costly item.

(11) *New Jowar Strains.*—The new jowar strains evolved at the Mohol Farm, viz. 47-3, 35-1 and M-9 have given increased

yield over the local jowar and some of the results are given below :—

Locality.	Name of the strain.	Yield per acre.		Remarks.
		Grain.	Fodder.	
Sholapur	47-3 ..	1,770	3,250	Irrigated.
Do.	Local ..	1,390	2,940	Do.
Mandrup	47-3 ..	1,440	2,500	Do.
Do.	Local ..	1,250	3,040	Do.
Kavathe	47-3 ..	1,050	2,670	Do.
Do.	Local ..	970	2,350	Do.
Gadegaon	M-9 ..	820	2,060	Do.
Do.	Local ..	860	4,025	Do.
Do.	35-1 ..	1,120	3,580	Do.
Dahiwadi	35-1 ..	816	2,000	Dry.
Do.	Local ..	660	1,480	..
Gundwadi	35-1 ..	410	1,800	Dry.
Do.	Local ..	360	890	..
Chichondi	35-1 ..	360	1,820	Dry.
Do.	Local ..	340	900	..
Sangola	M-9 ..	1,040	2,400	..
Do.	Local ..	1,000	3,260	..
Do.	M-9 ..	300	280	Dry.
Do.	Local ..	1,960	740	..
Ekhalpur	35-1 ..	700	1,840	Irrigated.
Do.	Local ..	900	2,580	....
Wadegaon	47-3 ..	350	1,440	Dry.
Do.	Local ..	300	880	..
Save	47-3 ..	600	1,600	Irrigated.
Do.	Local ..	640	1,860	....
Korti	M-9 ..	640	2,500	Irrigated.
Do.	Local ..	576	2,000	..
Do.	35-1 ..	864	2,800	Irrigated.
Do.	Local ..	720	2,500	....
Ozewadi	35-1 ..	1,330	3,330	Irrigated.
Do.	Local ..	1,000	3,000	....

In Ahmednagar District, the strain No. N.D. 15 was tried with local jowar in 5 Talukas and the results are given below :—

Locality.	Name of strain.	Yield per acre.		Remarks.
		Grain.	Fodder.	
		Lbs.	Lbs.	
Akola	N.D. 15 ..	173	526	Dry.
Do.	Local ..	116	390	Do.
Sangamner	N.D. 15 ..	246	624	Do.
Do.	Local ..	191	512	Do.
Shevgaon	N.D. 15 ..	321	1,661	Do.
Do.	Local ..	316	1,542	Do.
Newada	N.D. 15 ..	701	2,198	Do.
Do.	Local ..	558	1,900	Do.
Pimpri	35–1 ..	180	....	Do.
Do.	Local ..	155	....	Do.
Shrigonda	N.D. 15 ..	144	....	Do.
Do.	Local ..	180	....	Do.

In Poona District, the following Mohol Strains were tried and the results are given below :—

Locality.	Name of strain.	Yield per acre		Remarks.
		Grain.	Fodder.	
		Lbs.	Lbs.	
Koregaon	35–1 ..	1,080	..	Irrigated.
Do.	Local ..	960	..	Do.
Uruli	35–1 ..	1,440	..	Do.
Do.	Local ..	1,200	..	Do.
Vagholi	35–1 ..	840	..	Do.
Do.	Local ..	720	..	Do.
Shiraswadi	35–1 ..	720	..	Do.
Do.	Local ..	600	..	Do.
Baramati	47–3 ..	1,848	3,015	Do.
Do.	35–1 ..	2,002	3,200	Do.
Do.	Local ..	1,768	3,050	Do.

The season for rabi jowar was not very favourable, in spite of these disadvantages, the strains of the Mohol Farm have given higher yield in many places and there is a greater demand for these strains and during the year 12,200 lbs. of seed has been supplied.

(12) *Soya Beans.*—The cultivation of Soya Beans is gradually increasing, but unless there is a ready market for this product, it is not possible to increase the area to a considerable extent. This is a very nutritive food and hence a special propaganda for its use is necessary in the case of poor cultivators. The yields of Soya Beans at different places have been recorded and they vary from 350 to 600 lbs. per acre as a dry crop and from 1,400 to 1,800 lbs. of grain per acre in the irrigated tract.

(13) *Crop Pests and Diseases.*—The sugarcane crop on the Pravara Left Bank Canal was badly affected by grasshoppers and most of the leaves were eaten up. Attempt was made to catch the grasshoppers and destroy them, but this was not feasible in the case of thick cane crop. The only preventive measures recommended are ploughing the fields soon after the crop is harvested and cleaning the bunds. The green caterpillars (*Cosmophila Erosa*) has done a good deal of damage to the irrigated cotton crop in hot weather. The sugary disease had appeared on jowar, but the damage was not very serious. The attack of frost was not very severe this year. The crop of leafy vegetables and lucerne was severely affected by Aphis and the attack could not be checked even with the spraying of Fish Oil Rosein soap solution. The Panama disease is still doing a good deal of damage to the plantain cultivation at Ale of the Junnar Taluka. In Ratnagiri district, due to the late rains, the flowering of mangoes was delayed till the middle of December but when the new flush appeared in January it was very badly damaged by mangohoppers. Nearly 80 per cent. of the crop was lost in the North of Ratnagiri, while in the South those gardens which were dusted several times could bear about 8 annas crop. About 200 dust guns were constantly working in this season and in all 70,000 mango trees were dusted. In Ahmednagar District, a new root fungus on Mosambi trees has been detected. This disease is still under investigation. The treatment of Bordeaux mixture or sulphur on the soil or root does not produce desirable effect.

(14) *Fruits and Vegetables.*—On account of very bad season especially during the monsoon, the demand for Citrus plants was very much decreased and the nurseries at Talegaon-Shikrapur had to pass through a critical stage on account of insufficient water in the wells. When the seedlings began to dry, the nursery men had to dispose off the seedlings at a very low rate of Rs. 5 per 100 and the total seedlings supplied by them are nearly 1½ lakhs. The Departmental staff supplied 7,520 plants this year from Poona district. In Satara district, 11,000 plants of Orange and Mosambi and 1,735 grafts of mangoes were supplied. In Ratnagiri district, 5,000 mango grafts and 200 cocoanut seedlings were supplied. The Superintendent, Ratnagiri Farm, also supplied 6,530 suckers of Pineapple and 507 mango grafts.

On account of the strained relations with Italy, it was not possible to order Italian Potato seed; consequently an order for 10 tons of Scotch Epicure Potatoes was placed with the Imperial Chemical Industries (India), Ltd., and these potatoes were supplied to the cultivators of Poona District. This variety was very much appreciated by the cultivators as its yield was higher than any other potato seed. A comparative trial of different varieties was made in Khed Taluka at Khed, and its results are given below :—

Name of the variety.	Yield per acre in lbs.
Local	6,424
Fresh Italian seed	8,032
Epicure	8,640
Aran Pilot	4,326
Advancer	4,228

It is expected that the people will place a bigger order for Epicure seed.

(15) *Sugar-making by the Open Pan Process.*—During this year, the price of gul had gone abnormally low, viz., Rs. 8 to 9 per Palla of 250 lbs. The price of sugar also has been reduced from Rs. 9 to Rs. 7 per maund. Consequently, the cane growers preferred to supply their cane to the sugar factories rather than undertake the manufacturing of sugar and molassine gul by the Open Pan Process. In 3 places, however, they manufactured sugar and molassine gul and thus reaped the benefit of this process. The work done by Brihan Maharashtra Sugar Factory, with the Departmental sugar making plant, is summarised below :—

The crushing of cane started on 10th February 1937 and continued till the end of May 1937 and they crushed nearly 58 acres of cane and they produced 570 maunds of sugar and 5,870 maunds of gul. The proportion of gul was higher as they mixed more quantity of fresh juice in the Molassine gul. The average outturn of cane was 37·5 tons per acre.

The economic side of the produce of 1 acre is given below :—

From 37·5 tons of cane they got 2 tons of 1st sugar and 2·6 tons of molassine gul, which were sold at Rs. 175 and Rs. 55 per ton respectively. Thus the total realisation comes to Rs. 493. If they had prepared gul alone from 37·5 tons of cane, they would have got 37·5 Pallas of gul and it would have fetched Rs. 337-8-0 at the rate of Rs. 9 per Palla of gul. Thus it will be seen that they got Rs. 155-8-0 more by the manufacture of sugar and molassine gul, from which the extra expenditure of sugar making at the rate of

Rs. 1-4-0 per ton of cane is to be deducted. Thus the net advantage by the Open Pan Process comes to a little over Rs. 100 per acre. There was no difficulty in disposing off the sugar as the sweetmeat makers prefer the open pan sugar which is comparatively more sweet.

(16) *Sugar Factories.*—During this year, there was no addition in the number of sugar factories, but the capacity of each factory has been greatly increased and the total output of sugar is about 51,000 tons in the Deccan. The details of the area under sugarcane and the quantity of sugar produced are given below :—

Name of the factory.	Area under cane (excluding overlap).	Quantity of sugar produced.
	Acres.	Tons.
1. Belapur Company, Ltd., Belapur	2,850	13,000
2. Maharashtra Sugar Mills, Belapur	1,800	8,500
3. Marsland Price and Company, Kalamb	1,600	8,000
4. Ravalgaon Sugar Factory, Ravalgaon	1,500	4,000
5. Phaltan Sugar Works, Phaltan	1,800	6,500
6. Kolhapur Sugar Mills, Kolhapur	....	5,500
7. Saswad Mali Sugar Factory, Akluj	1,042	4,000
8. Belvandi Sugar Farm	400	1,500

The average recovery varied from 10·5 to 11·5 per cent. which is considered as one of the best recovery in India. Brihan Maharashtra Sugar Syndicate has also placed an order for the Skoda sugar machinery and they expect to start the work in the next season.

(17) *Shows and Demonstrations.*—During this year, 2 big shows were held in Poona District at Kondhanpur and Poona. A special Agricultural stall was arranged in the Poona Industrial Exhibition, which was attended by more than 2 lakhs of people. Besides this 50 small agricultural demonstrations of the standing crop were arranged in this district. Four small shows were also arranged at the time of the Patil's Darbar, presided over by the Collector of Poona.

In Satara District a big flower and vegetable show was organised at Mahableshwar and another show was arranged at Khatgun. Three big demonstrations were arranged at Kenjal at the time of His Excellency the Governor of Bombay's visit and at Taliye and at Satara at the time of the visit of the Honourable Sir D. B. Cooper and the Collector of Satara. Seventy-five agricultural demonstrations of the standing crops were also arranged.

In Sholapur District a big cattle and Agricultural Show was arranged in January which was visited by more than 30,000 cultivators. It was opened by the Commissioner, C. D., and lasted for 5 days. The Collector of Sholapur and Messrs. Gandhi Brothers took special interest in this Show. Besides 4 small shows were arranged at the time of the Jamabandi meetings and 133 demonstrations of the standing crops were arranged.

At Mohol Farm, a special demonstration of the standing crop was arranged, which was attended by a large number of cultivators from Sholapur, Madha and Pandharpur talukas. The jowar crop of the farm was in excellent condition and the advantages of dry farming were clearly seen on the Farm.

In Ahmednagar District, no shows could be arranged on account of the famine conditions, but 44 small demonstrations of the standing crops were arranged. On the Deccan Canals, a big show was held at Puntamba which was opened by the Honourable Minister of Agriculture and it was visited by 1,500 people.

Two big demonstrations were arranged at Rahuri and Mamdapur which were attended by over 1,000 cultivators and presided over by the Collector of Ahmednagar. Besides the above shows, 112 agricultural meetings, 16 crop demonstrations and 14 magic lantern lectures were arranged on the Deccan Canals.

In Ratnagiri District, a big Agricultural and Industrial Show was arranged at Kankavli, which was attended by 5,000 cultivators. Besides 75 field demonstrations were arranged during the year.

(18) *Agricultural Classes.*—During the year under report, 12 Agricltural Classes were held in this division on different subjects, such as land development, horticulture, sugarcane and other irrigated crops. 6 of them were arranged on the canal tract, 4 in Satara District, 1 in Ahmednagar District and 1 in Sholapur. The number of students attending each class varied from 25 to 70. These classes were held in co-operation with the Taluka Development Associations and have served very useful purpose. The work, however, could not be undertaken on a large scale on account of the famine conditions.

(19) *Rural Uplift Work.*—The work of Rural Uplift was conducted with a greater vigour throughout this division. In the Poona District, the work done in the Sirur Peta deserves special mention. Among the various activities, tree planting, village sanitation, preserving manure in pits and the distribution of Leghorn cocks are worth mentioning. In this district (8 breeding bulls were presented and they have served nearly 200 cows. 85 White Leghorn cocks and 10 Rhode Island Reds were also given to the Rural Uplift Centres. A special Rural Uplift Van was taken to several important places and actual demonstrations and magic lantern lectures were arranged at 26 places.

In Satara District, the Rural Uplift Van was taken in 18 places and agricultural lectures and demonstrations were arranged In the eastern part of the Satara District, 3 sets of dry farming implements were supplied. The work of tree planting was systematically done in Satara District on the Nag-Panchami day.

In Sholapur District, the Rural Uplift work was arranged in 17 centres and several demonstrations were arranged. The Village Improvement Committee, Sholapur, has contributed Rs. 2,100 towards the expenses of the Taluka Development Associations and Rs. 1,400 for the supply of pure seeds and purchase of implements. The Collector of Sholapur is taking keen interest in this work. The Village Improvement Committee of Sholapur has also maintained a Poultry Farm at Kumbhari.

In Ratnagiri District, the Village Improvement Committee has promised to help the seed farms of rice and nagli strains. It has contributed Rs. 500 to the Kankavli Show and has offered 2 Premium bulls to Ratnagiri and Devrukh Associations.

The Deccan Agricultural Association has also conducted the work in Khed-Shivapur Centre with greater vigour. The activities are concentrated in Agricultural Improvements, Medical help and Sanitation, Primary and Adult Education, Crop protection and improvement of roads. The agricultural improvements such as the dusting of peas, introduction of Pusa wheat, Akola bajri and jowar strains of Mohol, green manuring of sann, supply of vegetable seed and dusting of mangoes are the main important works conducted in this centre. Out of the 14 villages, the Primary Schools have now been established in 10 villages. Medical help has been given to more than 1,000 patients and about 17 labour cases were attended. The Association had arranged a big show at Kondhanpur and also arranged 3 conferences of the Rural Uplift Workers at Kondhanpur, Shivapur and Velu. The most important function of this year was the visit of Sir John Russel, who has carefully seen all the activities of this Association and has promised to consider the Rural Life of the villagers, while submitting the proposals of Agricultural Improvements to the Government of India.

(20) *Demonstration Plots.*—During this year, the following number of demonstration plots were arranged in South Central Division :—

Canal tract	392
Poona District	54
Sholapur District	179
Satara District	93
Ahmednagar District	136
Ratnagiri District	142
Total ..	996

(21) *Supply of seeds, manures, implements etc.*—During the year, the following articles were distributed in South Central Division :—

Name of article.	Poona District.	Ahmed-nagar District.	Shola-pur District.	Satara District.	Deccan Canals.	Ratna-giri District.	Total.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Cotton seed	500	18,400	24,471	18,976	33,450	..	95,797
Sugarcane sets	..	..	31,000	30,500	5,73,645	..	6,35,145
Wheat	2,600	2,100	1,300	7,260	5,404	..	18,664
Sann	1,600	..	1,375	485	27,800	..	31,260
Soya Beans	600	320	436	1,343	335	..	3,034
Jowar	3,600	5,690	6,740	1,417	3,310	..	20,757
Bajri	800	3,915	185	1,680	1,010	..	7,590
Potatoes	22,400	..	1,200	9,812	..	..	33,412
Rice	500	..	..	750	400	1,50,000	1,51,650
Nagli	..	..	..	221	..	20,000	20,221
Groundnut	1,000	..	..	15,760	37,669	..	54,429
Lucerne	..	12,000	170	..	33	..	12,203
Sulphate of Ammonia	..	19,728	560	..	1,225	350	1,584
					Tons.	Tons.	Tons.
Niciphos	..	5,600	..	..	250	..	5,850
Super phosphate	..	800	500	..	3	..	3½
					Tons.		Tons.
Bone meal	..	..	2,780	..	2,500	20	22½
						Tons.	Tons.
Oil cakes	..	..	500	..	24,360	..	24,860
Common salt (Denatured salt) ..	..	..	..	..	50	2,221	2,271
					Mds.	Mds.	Mds.
Sulphur Potash	1,120	280	..	..	..	..	1,400
Dhaincha	..	..	..	..	300	..	300
Maize seed	..	..	..	..	4,500	..	4,500
Berseem	..	..	10	10	46	..	66
	No.	No.		No.	No.	No.	
Fruit Plants	7,520	2,035	..	15,523	3,000	5,700	33,778
Implements	12	30	174	..	105	..	321
Crushers	..	..	..	..	38	..	38
Power Crushers	..	..	..	..	3	..	3
Oil Engines	..	..	..	..	1	..	1

Name of article.	Poona District.	Ahmednagar District.	Sholapur. District.	Satara District.	Deccan Canals.	Ratnagiri. District.	Total.
					No.		No.
Saccharometers	..	..	..	..	36	..	36
Thermometers	..	..	..	..	10	..	10
Turmeric	..	..	..	872	..	..	872
Ginger	..	..	..	1,000	..	..	1,000
	Rs.		Rs.	Rs.		Rs.	Rs.
Vegetable seed	400	..	48	14	..	1,000	1,415
	No.					No.	No.
Dusting machines	3	..	..	..	..	20	23
Sprayers	2	..	..	..	..	..	2

(22) *Publications.*—During the year under report, the following leaflets were revised and completed :—

Serial No.	Name of leaflet.	English.	Marathi.	Remarks.
1	Compost making	..	M	Leaflet No. 4 of 1936.
2	Method of obtaining good Jawari seed in the Deccan.	..	M	Leaflet No. 6 of 1936.
3	Pachat (Trash) as a manure for sugarcane.	..	M	Replaces leaflet No. 11 of 1916.
4	Preliminary instructions and hints for the cultivation of cotton on the Deccan Canals.	E	..	Replaces leaflet No. 3 of 1926.
5	The determination of ripeness in cane for gûl making, by the Brix Sachharometer.	E	..	Replaces leaflet No. 4 of 1914.
6	Effluent as a manure for sugarcane..	..	M	Replaces leaflet No. 6 of 1929.
7	Cultivation of Pine-apples ..	..	M	Leaflet No. 8 of 1936.
8	Control of Betel Vine wilt ..	..	M	Leaflet No. 7 of 1937.
9	The Meston plough for the Konkan..	..	M	Replaces leaflet No. 5 of 1915.
10	The sweet potato crop in the Konkan	E	..	Replaces leaflet No. 2 of 1923.
11	Cocoanut cultivation	..	M	Replaces leaflet No. 14 of 1932.
12	Use of wire for preventing lodging of sugarcane in Konkan.	..	M	Replaces leaflet No. 1 of 1925.
13	Control of the grain-smut of jowar ..	..	M	Replaces leaflet No. 13 of 1929.
14	Method of obtaining good jowar seed in East Deccan.	..	M	Replaces leaflet No. 18 of 1927.
15	Cultivators' leaflet on Irrigated Cotton.	E	M	....
16	Cultivators' leaflet on chili cultivation.	E	M	....

Besides, the staff of this division have published 70 articles in local newspapers and magazines and material for Agricultural Topics of the *Times of India* was also supplied,

Section IV.

Agricultural Organization.

(1) *Taluka Development Associations.*—As stated on page 115 of the last year's report, there were 46 Taluka Development Associations working in this division. During the year under report, the following new Associations were registered :—

Poona District—Bhimthadi.

Ahmednagar District—Parner, Shrigonda.

Thus, the total number of Associations have come to 49.

Most of these Associations are doing very useful work and have engaged trained Kamgars for undertaking the propaganda work. Their main lines of work consist of :—

(1) Supply of pure seed by exchange system.

(2) Arrangement of seed-farms with the help of registered seed growers.

(3) Supply and hire of improved implements.

(4) Arranging demonstration plots.

(5) Holding Shows and demonstrations.

The financial situation of good many Associations is not very satisfactory, consequently they cannot undertake the work on very large scale. The Associations in Satara District receive regular grant from the District Local Board and consequently their propaganda is much more advanced when compared with the other Districts.

(2) *Non-Credit Societies.*—(*a*) There are 3 implement societies in Ahmednagar District, but on account of the famine conditions, there was not much demand for ploughs during this season. The following is the summary of the work done by each Society :—

Name of the Society.	Number of ploughs stocked.	Hire collected.	Number of members.	Share Capital.
		Rs.		Rs.
Shevgaon	346	741	85	4,885
Pathardi	228	694	90	2,148
Jamkhed	78	21	36	1,125

Pathardi Society has now constructed its own buildings at a cost of Rs. 3,000.

(*b*) Agricultural Requisite Society at Malsiras has done fairly useful work by supply of seeds, implements and manures to the cultivators. It has realised Rs. 800 as hire of implements during the year.

(*c*) The Vadapuri Seed Society has distributed 20,000 lbs. of jowar, wheat and groundnut seed among its 75 members and has kept 27 implements on hire.

(*d*) The Nimbut Co-operative Crushing Society was not working fully this year as most of its members sold their cane to the Phaltan Sugar factory.

(*e*) The Sanvastsar Co-operative, Agricultural, Machinery and Implement Society, crushed 62 acres of cane and realised net income of Rs. 3,200.

(*f*) Regulated cotton market at Baramati.

During this year a new regulated cotton market was organised at Baramati according to the Cotton Market Act. The Market Committee has been formed and fairly good business was done for the 1st year. 7,030 carts of seed kapas from irrigated tract and 2,860 carts from dry tract were sold in this market. 725 carts of lint also arrived in this market for pressing. After defraying all the working expenses, the Market Committee has got a net balance of Rs. 2,000 at the end of the year. Open auction sales are arranged in this market but as the weighments could not be taken in the market for want of weigh-bridge, a good deal of higgling takes place in the gins where the cotton is weighed. The Market Committee has been advised to purchase one weigh bridge immediately and arrange the weighments in its compound. The cultivators are also advised to bring *kapas* in open carts and not in gunny bags, so that the merchants can examine all the stock before bidding in the auction.

The information about the auction sale of Jaywant cotton has been already given above.

Section V.

Agricultural Services.

(1) *Land Development.*—During the year under report, the work of land development was done on a large scale as the Bunding Officer, received the help of one Sub-Overseer, for Poona, Ahmednagar and Sholapur Districts each, from the funds of the Village Improvement Committee. The Collectors of Poona, Ahmednagar and Sholapur were impressed with the necessity of this work and agreed to engage one Sub-Overseer from the Village Improvement Committees' Funds. The

following statements show the number of applications received and their disposal :—

(I) Application for Tagai loan for land development.

STATEMENT A.

Serial No.	Name of District.	Number of applications.							
		Received.				Disposed off.			
		Balance.	During the year.	Total number.	Amount.	Number.	Amount.	Balance for next year.	Amount.
					Rs.		Rs.		Rs.
1	Poona	3 / Rs. 2,100	1	4	7,100	3	2,100	1	5,000
2	Sholapur	1 / Rs. 800	23	24	8,500	15	6,100	9	2,400
3	Satara	1 / Rs. 800	..	1	800	1	800	..	..
4	Ahmednagar ..	....	14	14	3,500	13	3,200	1	300
	Total ..	5 / Rs. 3,700	38	43	19,900	32	12,200	11	7,700

(II) Disposal of Applications from private individuals.

STATEMENT B.

Serial No.	Name of District.	Number of applications.				
		Received.			Disposed off.	
		Balance from last year.	Received during the year.	Total.	Disposed during the year.	Balance on hand.
1	Poona ..	16	17	33	20	13
2	Sholapur ..	15	49	64	34	30
3	Ahmednagar ..	26	32	58	9	49
4	Satara ..	1	5	6	3	3
5	Bijapur ..	2	1	3	..	3
	Total ..	60	104	164	66	98

The year under report unfortunately was a bad year owing to the scarcity of rain. It was particularly very bad in the eastern half of the Division, resulting in declaring scarcity by Government in Ahmednagar and Sholapur districts and the eastern half of the Poona District.

Due to the failure of crops people were rendered helpless and many began to starve as there was no work or food for them. Those who were better placed and had some money with them took advantage of the situation in improving their lands. The labour was abnormally cheap and available in any number. This gave a very great impetus to wealthy land-lords and good cultivators to get their fields bunded economically. This naturally resulted in a very great rush of work for the technical advice rendered by this Department.

The details of work done, viz., the schemes surveyed with the plans and estimates and actually executed are as under :—

STATEMENT C.

Serial No.	Name of District.	Number of schemes prepared with plans and estimates.	Approximate area covered in acres.	Remarks.
1	Poona	24	575	
2	Sholapur	33	970-16	
3	Ahmednagar	11	175	
4	Satara	3	84	

Thus it will be seen that a great amount of work has been done during this famine year. Plans for 71 schemes of land development were prepared in details for an estimated cost of Rs. 26,450 and covering an area to the extent of 1,804 acres. Out of these 22 schemes, costing Rs. 11,730 and covering an area of 805 acres have already been executed and the remaining schemes are on the way of their execution.

The advantages of Bunding to the people in the famine zone were markedly visible this year. The people could secure bumper crops despite the scarcity of rain in the bunded fields as against no crops on the adjoining lands. This fact will be borne out from the letter of the Collector of Sholapur who personally saw the crops on the bunded land of the Mohol Farm and at Nimbergi. The fact that " the bunding up of the land in the famine area alone (for taking maximum use of water by absorption and conservation of moisture in soil and stop erosion of

soil) is the most sound and practical anti-famine measure" must go unchallenged. It is, therefore, a sheer necessity to push on this class of propaganda in the famine tract and render technical advice and help to the poor and needy cultivators. There is a great awakening and anti-erosion mindedness amongst the cultivating public in the Division and the demand for the departmental technical advice is enormously increasing.

The details of some of the important schemes executed during this year are given below :—

(1) Model Bunding Scheme constructed at Hanga with the help of the Village Improvement Committee, Ahmednagar.

(2) Model Bunding Scheme constructed at Chikhali with the help of the Village Improvement Committee, Ahmednagar.

(3) Flooding scheme at Nimbergi.

(1) *Model Bunding Scheme at Hanga (Parner Taluka).*— A typical field was selected on the Ahmednagar-Parner Road in the village Hanga. The field extended upto 18 acres in area and had slopes into three different directions. The gradient varied from 1 to 5 per cent. Levels were taken and bunds on contour lines were layed out and constructed Bunds are placed at every five feet fall with three feet in height. Each bund is provided with a dry stone waste-weir in an alternate position. The total cost of the scheme is Rs. 400. The Village Improvement Committee contributed Rs. 250 while the owner incurred an expenditure of Rs. 150, through Tagai loan granted to him.

This is the first scheme of the type in the whole of the Ahmednagar District and is putting a very good demonstration to passers-by. There is a great awakening amongst the cultivating public of the Parner Taluka who are paying visits to this Scheme.

(2) *Model Bunding Scheme at Chikhali (Sangamner Taluka).*— Another scheme of a different type has been constructed at Chikhali (Sangamner Taluka) a centre of the Village Improvement Committee. This is a Tal-work against a fairly big Nala having a catchment area of over one square mile. An earthern embankment with a masonry waste-weir of a cushion type is put up to reclaim the waste land in the Nala-bed and stop further erosion of soil from the adjoining fields. The total cost of construction of the scheme is about Rs. 600, out of which Rs. 250 only are contributed by the Village Improvement Committee, while the villagers supplied the manual labour, bullocks and carts free.

This also is a good demonstration scheme being on the road side (Sangamner-Akola Road) and innumerable cultivators are paying visits to it.

It will really be a very good thing, if the other districts try to follow this example viz. of having a couple of Model Bunding Schemes in their districts.

(3) *Flooding scheme at Nimbergi* (*Sholapur*).—Another scheme worth making a mention is the flooding scheme at Nimbergi constructed this year by one Mr. S. B. Birajdan. This is a big Tal-work (earthen embankment) about 3,000 feet in length and 12 feet in height with a provision of a masonry waste-weir of most modern type. It floods an area of about 35 acres and arrangements to drain off the water quickly have been made by providing sluice gates and holes in the body-wall of the weir. The scheme costs about Rs. 2,000 only.

Mr. S. B. Birajdan is a staunch follower of the Department and is a big and progressing cultivator. The biggest Tal-work constructed so far in the Division, in the year 1930 belonged to him. He has spent more than Rs. 22,000 on the construction of Bunds alone, during the course of last 10 years and this activity is still in progress. He really deserves commendation and a gold medal in appreciation of his hearty co-operation with the Department.

(2) *Engineering Advice and Assistance.*—There was a demand for the services of the Mechanical Assistant from 13 places and he attended 10 and the rest he could not do for want of time :—

(*a*) *The following Power Cane Crushing Plants and Erection were attended :—*

(*i*) 44 Chattanooga Mill and a 6·5 BHP Blackstone Engine for Mr. Sopariwalla at Manjri Budruk, Taluka Haveli, District Poona.

(*ii*) One Hemant Cane Mill, 18 BHP Hindustan Cold Start Crude Oil Engine ; one rotary water pump $1\frac{1}{2}''$ for the engine ; one $1\frac{1}{2}''$ Centrifugal Pump for the juice ; One masonry tank for water circulation of the Engine and one for the cane juice erected for the Government Farm, Kopergaon.

(*iii*) A three roller ($14'' \times 20''$ each) Ruston Proctor Mill and one 28 BHP Cold Start Crude Oil Engine of Ruston Hornsby make ; A 3″ Counter Shaft ; 2 Centrifugal pumps $1\frac{1}{2}''$ size each for water circulation of the engine and one for juice ; juice and water tanks erected for the Sanvatsar Co-operative Agricultural Machinery and Implement Society, Taluka Kopergaon.

(*b*) *Erection of Pumping Plant :—*

(*i*) One of $5'' \times 4''$ Centrifugal Pump and 9·5 BHP Ruston Proctor Oil Engine with a $2\frac{1}{2}''$ Counter Shaft on well for Mr. J. R. Sopariwalla at Fursungi, Taluka Haveli, District Poona.

(*c*) *Site selection for pumpting plants :—*

(*i*) Kharpudi, on river Bhima, for the Khapurdi Co-operative Society for installing pumping plant to irrigate 200 acres of land. The selected site was approved by the villagers.

(*ii*) 5 wells at Mancher were visited and measurements taken for Mr. Sultan Ali Inamdar for irrigating his potato and orange gardens.

(*iii*) One well at Koregaon Mul, Taluka Haveli, was visited for Mr. Jaiwantrao Tukaram Savant, Inamdar, and a 3″ Centrifugal Pump and a 9·5 BHP Hindustan Cold Start Crude Oil Engine were advised and this machinery is now actually working.

(*iv*) One well at Limtekadi, Taluka Bhimthadi, District Poona, was visited for installing pumping plant of 4″ size for Rao Saheb Jachak.

(*d*) *Site selection for the erection of one* 18 *BHP Hindustan Cold Start Crude Oil Engine and a* 92 *Chattanooga Mill.*

This was done at Katechi Wadi, Taluka Bhimthadi, for Rao Saheb Jachak.

(*e*) *Drawings for the sugar making plant* (*Machinery and furnaces*).—These were supplied to Dr. Nagan Gawda, M.A., Ph.D., at Hospet, District Bellary, Madras Presidency.

(*f*) *Rab making pans and filters* (*treated with active carbon*).—These were got manufactured with the help of the local workshops for working for the Swadeshi Sugar Mill at Palanpur, Kathiawar, and for the Lucknow Exhibition, 1936, visited by the Viceroy of India.

Section VI.

Miscellaneous.

(1) *Co-ordination with the Officers of other Departments.*—During the year under report, there was good co-operation with the officers of the Revenue, Irrigation and Co-operative Departments. The Collector of Poona, Ahmednagar, Sholapur and Satara, took very keen interest in all the agricultural activities of the Department. The Executive Engineer of the Nira Right Bank Canal, Mr. E. P. Little, deserves special thanks of the Department as he has removed several grievances of the cultivators by personal discussion with the Officers of the Agricultural Department.

(2) *Divisional Board of Agriculture.*—I was a Chairman of the Deccan Divisional Board of Agriculture, till 1st November 1936 when the Chairmanship was transferred to the Assistant Registrar, Co-operative Societies, Central Division, Poona. During this period, two meetings were held at Poona on 4th August 1936 and 26th September 1936 which were attended by all the members. The request of the Divisional Board to add two more unofficials representing the interest of cotton growers, has now been granted by the Government of Bombay. As the number of the Taluka Development Associations is now increased to 49, there is a necessity of one full-time Agricultural Graduate to look after their work.

V. V. GADGIL,

Poona, 10th August 1937. Deputy Director of Agriculture,
South Central Division,
Poona.

Programme of work for the year 1937-38, in South Central Division.

Research.

Kopergaon Farm.

(1) All the items mentioned on page 120 of the last year's Report will be continued.

(2) A new K. P. N. Series of manuring sugarcane will be added.

(3) All the experiments will be recasted on up-to-date scientific lines.

Mohol Farm.

(1) All the work mentioned in last year's Annual Report will be continued.

(2) Selection of promising strains from Bedri variety of Ahmednagar will be continued.

Ratnagiri Farm

(1) All the items mentioned in last year's report will be continued.

(2) The cultivation of "Kew" Pine-apple will be extended on a commercial scale with special object of supplying its suckers.

Propaganda.

(1) All the work mentioned in the last year's report will be continued.

(2) The trials of Co. 419 and Co. 360 will be undertaken on a large scale.

(3) The cultivation of cane on water-logged areas will be undertaken.

(4) K. P. N. Experiments on cane will be arranged in the Sugar Factory areas both for Adsali and Plant canes.

(5) A Central Sugar Making Machinery will be installed for a radius of 5 miles and the cane growers will be asked to prepare rab according to the instructions of the Agricultural Department.

(6) Distribution of pure seed will be organized through the T. D. Associations on exchange system.

V. V. GADGIL,

Poona, 10th August 1937. Deputy Director of Agriculture,
South Central Division, Poona.

APPENDIX E.

Summary of Work done under the Deputy Director of Agriculture, Southern Division, for the year 1936-37.

Staff.

(1) I held charge of the office of the Deputy Director of Agriculture, Southern Division, Dharwar, throughout the year. Rao Saheb G. L. Kottur, Cotton Breeder, S. M. C., Dharwar, was on leave for 3 months from 1st August 1936. Mr. V. C. Pavate held charge of the office of the Cotton Superintendent, S. M. C., Dharwar, throughout the year. In the subordinate service, Mr. S. L. Lele was transferred from Poona to this Division. Mr. B. H. Galgali, Sub-overseer, was deputed to do the preliminary work in connection with the Karnatak Agricultural Show at Belgaum. There were a few other minor changes.

Season.

(2) The antemonsoon rains were inadequate and the early monsoon rains were good in Kanara, Malnad and Gadinad ; but they were deficient in the eastern dry tract especially in Bijapur District. The kharif crops except paddy in Malnad could be sown in time ; but all suffered from want of rains in July and August. September and October rains helped these kharif crops to a certain extent but normal yields could not be obtained. They suffered most in Bijapur district. The rabi crops did fairly well except in Bijapur district. Rice grew well in Kanara district but was attacked by "Kane" pest (Pachydoplosis oryzae) in many places and the yields were reduced. In Malnad the sowing was late and the crop suffered from want of rains. The yields ranged from 60 to 80 per cent. normal. Kharif jowar suffered when young from a long break in July and August and the yields were 50 to 75 per cent. normal. Cotton sowing was late in many places and the crop suffered from want of rains and eastern dry winds to a great extent. On the whole the yields were only 40 per cent. normal. Groundnut was sown in time in Gadinad but could not be sown at all in many places of the eastern dry tract. The crop suffered from want of rains and yields ranged from 40 to 80 per cent. normal. Bajri in Bijapur district practically failed. Pulses shared fate with kharif jowar. Wheat and rabi jowar did fairly well except in Bijapur district. The yield of wheat was 70 per cent. normal and that of rabi jowar 60 per cent. The agricultural season on the whole was fair in the western half of the Division and poor in the eastern half. There was scarcity of fodder, especially in the Bijapur district and cattle suffered. The economic position of the cultivator has gone from bad to worse.

(3) The work done during the year is summarised under the same heads as it was done in previous years to facilitate references : (*a*) Research and Experiments ; (*b*) Propaganda ; (*c*) Organisation ; (*d*) Services to the public ; (*e*) Agricultural education and (*f*) General.

(*a*) RESEARCH AND EXPERIMENTS.

(4) *Dharwar Farm.*—Plant breeding work on cotton which is the main money crop of the Division continued to receive major attention. Jayawant cotton was compared for yield in six replicated plots with Farm Kumta. There was no difference in the yield of seed cotton. Jayawant with its higher ginning and better staple fetched more value to the cultivators.

(5) The strains of Jayawant × 15 cross were compared with Jayawant according to Fisher's method and Jayawant × 15 (11-0-1-4) gave higher yield than Jayawant. It is superior in ginning percentage and as good as Jayawant in staple. The trials of this cotton will be extended in the district. Selections in (Dharwar 1 × Rosea 1A–14–3) × (Dharwar 1 × Dharwar No. 2–1-0–1) and (Jayawant × N-14) × (Dharwar 1 × Rosea 1A–14–3) crosses made with the object of getting strains ginning higher than 33 per cent. continued. The three crosses—Jayawant × N. 14, Jayawant × M.D. and Dharwar 1 × Dharwar 2, strain 10-1—were maintained pure as reserve material. They are slightly earlier than Jayawant and are likely to suit the dry tract of Bijapur district.

(6) *Behaviour of wilt resistant cottons.*—A number of wilt resistant cottons were tested for their reaction in the artificially infected plot specially maintained for the purpose. Dharwar 1 suffered 45·2 per cent. The deaths in wilt resistant cottons varied from *nil* to 9·2 per cent. Jayawant suffered 0·8 per cent. Hagari from Bellary which is coming in Bagalkot area was tested for wilt resistance and it was found to suffer 61·0 per cent.

In the Green House, the seed of 36 transplants reported last year as immune was tested. It was found that all the plants resisted wilt 100 per cent. and grew well but they showed mottling. This mottling, however, was confined to the cotyledons and was faint. It was also observed that the isolations made from these plants gave the fungus only in the seedling stage. It may be stated, therefore, that Dharwar selections allow the penetration of the fungus under the rigorous conditions of the Green House as obtained at Dharwar but resist its attack and kill it as they grow. Eleven strains which possess these characters have been maintained pure by selfing and it is proposed to test some of them under the uniform conditions of the Glass House and the temperature tanks at Poona.

(7) *Selfed seed.*—Selfing was done as usual on Jayawant cotton at Dharwar and on Gadag No. 1 cotton at Gadag. 500 lbs. of Jayawant and 420 lbs. of Gadag No. 1 cotton have been obtained.

(8) *American cotton work.*—Four strains of the cross Gadag No. 1 × Cambodia were compared with Gadag No. 1, Dharwar-American 2-6-5 and Gadag No. 1 × 102 E 4, both at Dharwar and Gadag. Gadag No. 1 × Cambodia strain Nos. 9 and 12 seem to be promising at Gadag and the trials will be repeated next year. Samples of these have been sent for spinning tests.

(9) *Spinning tests.*—Eight cottons were sent to the Director of Technological Laboratory, Bombay, for spinning tests. Jayawant × 15 No. 11-0-1-4 gave results equal to Jayawant. Other numbers of the cross though equally long in staple, fared inferior to Jayawant.

(10) *Seed testing.*—72 samples of Jayawant and Gadag No. 1 seed received from the Cotton Staff and the Cotton Sale Societies were tested for germination. The percentage of germination varied from 81 to 98. The percentage of impurity was high only in two cases.

(11) *Russian cottons.*—A small number of seed of 20 Russian cottons was received from the Director of Agriculture for trial at Dharwar. They were sown in wilt free plot during the year. With the exception of one, all belonged to G. herbacium and were very late. Few plants produced bolls and the cotton was observed to be either short or medium stapled. Only one cotton No. 2999 belonged to G. neglectum and was early. The seed of 12 plants is reserved for a second trial.

(12) *Jowar.*—The selected strains of Fulgar White, Fulgar Yellow, Nandyal, Bilichigan and Savaner varieties of jowar were maintained pure and the seed was distributed to the cultivators from Dharwar Farm. The total quantity of seed distributed was 6,164 lbs.

(13) *Groundnut.*—Improved Spanish 5-1 was compared with Spanish 5 again during the year in 6 replications and it gave higher yield of 2,517 lbs. per acre against 2,281 of Spanish 5. The increase in yield which is 9·9 per cent. is significant. The seed of improved Spanish is larger than Spanish 5 and is more attractive. It is proposed to try this in cultivators' fields during the coming season. Pondicherry No. 8 was maintained pure and 1,570 lbs. was produced on the farm for distribution in the district especially in Mundargi Petha of the Dharwar district.

(14) *Gram.*—The wilt resistant strain No. 18 was compared with local gram in replicated plots. Its yield was 481 lbs. per acre against 115 of local. The percentage of wilted plants was only 1 against 74·4 of local. The grain of this strain is of one uniform colour and size and is, therefore, more attractive to the market. Trials will be extended in the district during the coming season.

(15) *Other experiments on Dharwar Farm.*—Five varieties of jowar, viz., Nandyal, Fulgar Yellow, Fulgar White, Bilichigan and Muddinandyal, were compared according to Fisher's method in 5 replications. Fulgar White gave the higher yield of grain (1,025 lbs.) whereas Nandyal gave the highest yield of kadabi (3,842 lbs.). Nandyal is a variety liked by the cultivators both for grain and fodder and is getting popular. If the results of all the previous years are taken into consideration, Nandyal stands best. Five varieties of cotton, viz., Dharwar No. 1, Dharwar No. 2, Jayawant, Kumta and Dharwar No. 1 × Rosia were compared according to Fisher's method in 5 replications. Jayawant gave the highest yield of 475 lbs. per acre. Four varieties of wheat, viz., local red, Bansi 808, Bansi 103 and Pusa 3 were compared in

5 replications. Bansi 808 gave the highest yield of grain (515 lbs.) and chaff 824 lbs. per acre. It is rust resistant and its cultivation is spreading in the district. Three varieties of gram, viz., local, Burma and wilt-resistant strain No. 18 were compared in 5 replications. Strain No. 18 gave the highest yield 601 lbs. grain and 200 lbs. chaff per acre. This will be given extensive trials in the district during the coming season. Five varieties of tobacco, viz., Nipani, Nadiad No. 6, Adcock, Harrison Special and Anikivi were compared in 5 replications. Harrison special gave the highest yield of 836 lbs. dry leaf per acre. Adcock stood next. Three varieties of castor, viz., local, Gujarat strain No. 5 and Haveri were compared in five replications. Local stood best. Three varieties of ground-nut, viz., Spanish peanut No. 5, Improved Spanish peanut and Valentia were compared in 5 replications. Improved Spanish peanut gave the highest yield of 1,472 lbs. pods per acre. Jayawant × 15 cotton was compared with Jayawant in 10 replications according to Student's method. Jayawant gave 644 lbs. kapas per acre against 644 lbs. of Jayawant × 15 cross. The results are significant.

(16) *Manurial experiments.*—In the Farm Yard Manure experiment, 15 tons Farm Yard Manure once in two years has produced highest yield of jowar and cotton, but10 tons has given the best economic results. The results of Sann green manuring on cotton and wheat are not encouraging and confirm the observations made in the previous years. The application of Sulphate of Ammonia (14 lbs. N per acre) in addition to 2½ tons Farm Yard Manure has given higher yields ; but the extra yield has not covered the extra expenditure. The application of Sulphate of Ammonia (28 lbs. N per acre) to cotton crop has also produced higher yield but not covered the extra expenditure indicating that application of Sulphate of Ammonia is not advantageous to dry crops. Bonemeal 112 lbs. and 224 lbs. per acre was compared with no bonemeal to jowar and cotton crops in 5 replications with negative results in confirmation with those of the past year. The residual effects on cotton are not also encouraging.

(17) *Rotational and cultural experiments.*—In the three-year-rotation experiment, jowar-cotton-groundnut series has given better results than others in confirmation with those of the previous year. In the two-year-rotation experiments, jowar-cotton series has produced better results than others this year. Taking all the results of previous years together, however, jowar followed by groundnut and gram has given the best results. In the seed rate experiment on groundnut, 120 lbs. seed per acre has given the highest yield. Cotton and groundnut in alternate rows followed by jowar was found again to be more paying than cotton and groundnut in blocks followed by jowar. The results of experiments on groundnut with and without a second crop are in favour of the latter ; unlike those in the previous year. Unsieved jowar seed gave again better results than sieved seed during the year under

report. Length and crosswise sowing of wheat produced no better results than only lengthwise sowing. Soyabean tried in black soil produced higher yield (868 lbs. per acre) than that in the light soil (652 lbs.). The application of kerol to potato crop against Sclerotium rolfsii was not effective again during this year and the experiment will be abandoned.

(18) *Garden crops.*—Mango trees bore fruit during the year. The value of produce per acre was Rs. 107-5-0 and cost of cultivation was Rs. 46-6-4 leaving a net profit of Rs. 60-14-8 per acre. The number of mango grafts sold during the year was 113 for Rs. 141-4-0. Fig plantation was removed as it was not a successful one. Three varieties of Agave have been tried as hedge plant. These have taken root.

(19) *Poultry.*—Poultry on Dharwar Farm has been serving a very useful purpose and is attracting the attention of the public. There was an accident to the incubator and sitting eggs were spoiled. A greater portion of the feeding stuff was continued to be grown on the Farm. The total value of the food was Rs. 211-6-9 or Re. 0-2-8 per bird per month. The total sale proceeds amounted to Rs. 267-9-3. The loss was due to the accident. It is proposed to raise and distribute 300 birds every year and a scheme has been submitted accordingly.

(20) *Gokak Farm.*—Sugarcane continued to receive major attention on this irrigated farm. The average yield of gul per acre for the whole of the farm was 8,710 lbs. against 8,181 lbs. of last year. The increase was largely due to good antemonsoon rains. The prices of gul were very low during the year under report and no profits could be realised, though the yields were high. The new engine and pump fitted up recently have been a great asset. The other paying crops of this farm continued to be maize and cotton, maize and tur, cotton and groundnut and cambodia cotton. The following useful experiments were conducted on this farm.

J 213 was compared with H.M. 544 in karl soil on Student's method in 10 replications and it gave significantly higher yield in confirmation of the last two years' results. 10 and 20 cart-loads of Farm Yard Manure per acre to J 213 cane gave more profits than 30 cart-loads in confirmation of the last year's results. 75 lbs. N. topdressing to J 213 gave slightly less yield but more net profits than 150 lbs. N. In confirmation with the results of the last 3 years, Cambodia cotton 3 feet apart with one row of groundnut in the middle gave better results than 4 feet apart with two rows of groundnut in the middle. In confirmation with the results of last 6 years, maize and cotton gave better profits than maize and tur in wilt affected plots. Selection work in maize for yield and earliness and that in tur for wilt-resistance continued and a few strains are found very promising. Possibility of selection in chillies for Murda resistance has been explored and the prospects for such selection seem to be hopeful. Research work on the keeping quality of Malnad gul was continued to a certain extent and some more samples of gul and juice were analysed

Garden chairs, tables, fans and tatties were got prepared from the arrows of J 213 cane and they have been decent to look at, light to handle and fairly durable in wear. Easy methods of bleaching and colouring the arrows are being experimented.

(21) *Nursery and orchard.*—The nursery and orchard on the Gokak Farm continue to be a paying concern. The total receipts were Rs. 1,645 and the expenditure including over-head charges was Rs. 1,115 leaving a net profit of Rs. 530 against Rs. 155 of last year. The demand for lemon seedlings and Santra, Mosumbi, Italian lemon and seedless guava grafts is increasing and the nursery on Gokak Farm is successfully meeting it. Banana plantation completed its 8th year and a net profit of Rs. 125 per acre was realised against Rs. 109 of last year. The new pomegranate plantation yielded 12,763 fruits against 7,533 of last year. The total per acre income was Rs. 377 and the total expenditure was Rs. 157 leaving a net profit of Rs. 220 against Rs. 120 of last year.

(22) *Mugad Rice Breeding Station.*—Four promising strains of Mugad viz. Early 161, Inter 81 and 249 and Late 141 and 3 strains of Antersal viz. Early 67, Inter 90 and Late 200 which yield more than local were maintained and multiplied on Mugad Farm. 3,515 lbs. of seed of Mugad strains sufficient for 45 acres and 2,060 lbs. of Antersal strain sufficient for 26 acres were produced for further multiplication in cultivators' fields. 24 strains of Mugad and 28 strains of Antersal have been kept in reserve. Selection in Dodgya variety of paddy was continued in its 7th year. Seven promising strains of this variety were compared for yield with local and Belgaum checks according to Fisher's Method in five replications. Six out of seven strains fared better than local and Belgaum checks. The strains 5-1-1, 6-2-2 and 6-2-3 are very promising and they will be tried in the district. Five Indian rices referred to in paragraph (22) of last year's report were compared with Mugad 141 and Sannabhatta. Luchai was observed to be a promising fine early variety. The trials will be repeated. Selections in local fine varieties continued. The inheritance of grain shedding in the cross between Mugad 81 × Gonag was studied in F_3 generation during the year. The grain shedding character appears to be governed by more than three cumulative Genesis.

(23) *Kumta Farm.*—Rice breeding continued to be the main work of this Farm. The early muskaty strain 1,315 was compared with the ordinary muskaty and other local varieties of the coastal talukas and was found to be yielding better than all others in confirmation with the results of previous years. Muskaty 1,315 was compared with Muskaty 1,012 which was maintained in the kept-on culture and Muskaty 1,012 was found to be decidedly lower yielding than 1,315. The mid-late Jeddu strain 1,061 was compared with ordinary Jeddu and local early variety and it was found to be better yielding. Jeddu strain Nos. 80, 93 and 99 were observed to be less yielding than Jeddu strain 1,061. Red Halga strain No. 244 was compared with local Halga and Mugin-Bendu and was found to be higher yielding. The increased yield of

paddy was 38·7 per cent. over ordinary Red Halga. This higher yield is largely due to the resistance of the strain to "Kane" pest. Selection in Mugin-Bendu variety continued and some strains are found promising. Six strains of up-ghat white Halga were compared according to Fisher's Method and all these gave increased yields of significant value varying from 9 to 26 per cent. over the check. Trials of flood-resistant strains of Kagga paddy indicate that they vary in their resistance from year to year and it is proposed to drop this item of work. The two Halga 244 × Antersal 90 and Jeddu 106 × Mugad 161 were studied in F_2 generation.

(24) *Sugarcane and other crops.*—In the varietal experiment, H.M. 544 and H.M. 87 continued to give better results than others. During the year under report, Cambodia 402, 413, 414 and 421 were planted on a small scale. They will be grown on a larger scale next year for comparison. The manurial experiment on mangoes did not give any results. In the fertilizer experiment on betelnut conducted in a cultivator's field, the application of bonemeal Undicake gave the best results. The cultivation of Cocoanut as a dry crop was continued. The growth of the trees is very satisfactory. Some trees are bearing and yields are being recorded. Pine-apple plantation (Kew variety) was extended by 16 gunthas to provide more suckers for the district. Two manurial experiments, one with fertilisers and the other with different doses of Farm Yard Manure, have been laid out to see what fertiliser and what quantity of Farm Yard Manure are required for the satisfactory growth of pine-apple. It is too early to make any statements. Kew variety produces only a few suckers. Experiments to induce more suckers (*a*) by cutting away the crown just at the flowering stage and (*b*) by stirring the soil to irrigate the roots to develop the suckers are in progress. Six new varieties of pine-apple have been planted to test the yielding capacity. During the year under report, 3,000 suckers of Queen and 500 suckers of Kew variety were distributed from the nursery on the Kumta Farm. This nursery also supplied 500 mango grafts and 500 other fruit seedlings to the cultivators. Its extension and development is under consideration. Soya-bean failed on Kumta Farm. Italian lemon plants have thrived well. The soil and the tract seem to be suited for this fruit tree.

(25) *Gadag Seed Farm.*—The field of the cultivator referred to in paragraph (25) of the last year's report, was continued to be treated as seed farm. 420 lbs. of Gadag No. 1 seed has been selfed and 7,226 lbs. seed in the second stage has been raised on this farm during the year. The owner of the field continued to help the Department in all possible ways and deserves thanks. The cultivation was of high order. He also spared land for the trial of six American cottons sent from Dharwar Farm.

(26) *Tegur Cattle Breeding Farm.*—The cross between local cows and Amrit Mahal bull continued to show progress. The bull has gone old and needs replacing. 9 bull calves and 15 cow calves were born during the year and almost all of them resemble pure Amrit Mahal. Out

of 6 buffalo bull calves obtained during 1934-35 from the College Dairy, one died and one was sold to the Kumta Municipality during the year. The remaining four will soon be sent out as breeding bulls. Four heifers and one bull were obtained from Bankapur Farm. One buffalo bull calf has been received from the Livestock Expert for being reared on the Farm. A Tick Dip has been constructed. The total number of herd on 31st March 1937 was 133 against 132 of last year. 7 bull calves were sold during the year. The bull calves sold in previous year for draught purpose have attracted the attention of the cultivators all round Tegur. Results of crossing local ewes with Merino ram, however, continued to be good. Hay and silage were prepared on the Farm as usual and jowar and kulthi were grown for the combined object of fodder and grain and lucern is also grown to some extent under well irrigation. Expenditure per head of cattle was Rs. 17 per year against Rs. 20 of last year.

(27) *Experiments on cultivators' fields.*—The District staff continued to conduct experiments on cultivators' fields as usual. Jayawant cotton was compared with local Kumta in 42 plots all over the Division in different kinds of soils. The average yield of Jayawant cotton from these experiments calculated in lint was higher than that of local Kumta though the difference was not great. Gadag No. 1 cotton was similarly compared with Dharwar-American in 6 places in Gadag and Ron talukas of the Dharwar District. In both these centres the results were decidedly in favour of Gadag No. 1. Cambodia cotton (Co.2) was compared with Upland under Canal and well irrigation at 3 places. Cambodia (Co.2) gave on an average 625 lbs. of kapas per acre against 493 of Upland. Cambodia cotton is gaining ground in the irrigated tract. A strain of Dharwar 1 × Dharwar 2 cross and Early Jayawant was compared with local Kumta and Jayawant cottons in the Bijapur area in three places. Owing to scarcity of rainfall the yields were very poor but Early Jayawant did slightly better than the other two. The experiment needs repetition. The trials of selected strains of Rabi jowar were conducted at 7 places, Maldandi strain No. 35-1 in three places and B.D. 24 in 4. Maldandi fared better than local whereas B.D. 24 has not done well. Selected strains of paddy were compared with local in all the important paddy growing centres of the Division. The Mugad Farm selections gave on an average 12·3 per cent. higher yield. In the North Kanara District, Kumta Farm selections were compared with local at 19 places and they gave increased yields from 6 to 15 per cent. The trial of Pivala Kathya strain No. 808 was continued in 13 places and it gave more yield than local in almost all cases. There was no rust attack during the year but the yields were low due to want of rains in many places. Pondicherry strain No. 8 groundnut was tried in 5 places against the local. Its average increased yield was 135 per cent. over the local. Spanish peanut strain No. 5 gave increased yield in both the places where it was tried. J 213 variety of sugarcane was compared with the local Pundia in 4 places. There was no much difference in yield. Wilt-resistant gram was tried only in one place, but the

experiment was vitiated. Soya-bean was compared with kharif crops in 9 places in different kinds of soils and under different conditions of rainfall. It did better than Kulthi, Mug and the Matki, but poorer than groundnut. Nadiad No. 6 tobacco was tried against Nipani in two places and it gave higher yield in both.

(*b*) Propaganda.

(28) *District Cotton Work.*—The New Seed Multiplication Scheme sanctioned by the Indian Central Cotton Committee and the Government of Bombay referred to in paragraph 28 of last year's report was brought in force during the year under report. The work in connection with Jayawant cotton was undertaken from 7 centres and that with Gadag No. 1 from two centres as planned in the scheme through the societies and agents. All centres worked well except Hubli where the Sale Society did not accept the New Scheme and worked independently. The reserved area under Jayawant cotton in 6 centres was 25,006 acres and that under Gadag No. 1 cotton in two centres was 22,614 acres. The crop was rogued under careful supervision and the rogueing charges came to 4·43 pies in the case of Jayawant and 4·22 in the case of Gadag No. 1 cotton. Besides the area organised by the Department, Hubli had its own reserved area under Jayawant. The agents selected in new centres worked very sincerely and made a very good beginning. They suffered in seed transactions but did not mind. The quantity of Jayawant cotton seed stocked was 1,568,644 lbs. and that of Gadag No. 1 was 1,419,600 lbs. The season for cotton was very unfavourable and some seed remained unsold. The quantities actually distributed and the area covered were 862,643 lbs. 100,717 acres in the case of Jayawant and 844,250 lbs. 84,410 acres in the case of Gadag No. 1 cotton. The Hubli Cotton Sale Society distributed 792,153 lbs. seed and covered an area of 86,483 acres. Taking into account the seed distributed by other agencies also, the area under Jayawant cotton during the year under report was about three lacs acres and that under Gadag No. 1 cotton about one lac acres.

(29) *Grading and auction sales.*—Grading and auction sales of Jayawant and Gadag No. 1 cottons were organised in all new centres through the help of the agents and this new move made by the Department was very much appreciated by the cultivators as they got better prices in all the auction sales. The agents worked very hard in pooling together the produce from the cultivators to whom they had supplied seed as they were interested in getting their commission. They gave also advances to the deserving cultivators on their standing crop and worked very closely with the Cotton staff in making these auction sales of improved cottons very successful. The Gadag Sale Society continued to sell its cotton mostly by holding auction sales, but Hubli by private treaty. The total number of dokras sold by auction was 10,242 in the case of Jayawant and 10,089 in the case of Gadag No. 1 cotton. The extra prices realised in auction sales were about Rs. 10 per naga of 1,344 lbs. seed cotton on an average. In these auction sales held during the year

1,568,644 lbs. Jayawant and 1,419,600 lbs. Gadag No. 1 cotton seed have been purchased and stocked by the agents and Gadag Sale Society for distribution during the next season.

(30). (*a*) *Working of the Cotton Transport Act.*—26 check stations were opened during the year against the same number last year and the District Agricultural Overseers continued to supervise the working of the same. Licences were issued as usual from Gadag, Bagalkot and Nargund offices for import of good cotton from the bordering villages outside the protected areas. The total quantity thus imported with the help of licences was 1,999 dokras and 78 carts seed cotton and 20,681 dokras of lint into the Kumta-Dharwar area and 122 dokras of seed cotton and 4,453 dokras of lint into the Bagalkot area. The Cotton Transport Act continued to work well in the interests of growers as well as consumers of cotton. Illicit import by rail was totally stopped whereas that by road continued to a certain extent with all the arrangements made to improve the efficiency of the check stations. Rules under the Cotton Transport Act require some amendments to empower the Officers of the Agricultural Department to deal effectively with the illicit import of cotton by road and a separate officer to work as detective is needed.

(*b*) *Working of the Cotton Markets Act.*—The Act was applied first to Bailhongal market during the year under report. The Deputy Director of Agriculture was appointed as the Supervisor. The Cotton Superintendent was elected as the Chairman of the Market Committee. Eleven Managing Committee meetings were held. The by-laws of the Committee were framed and they were got approved by the Commissioner, Southern Division. The Market yard was secured from the Municipality and plots were made according to the demand of the dalals. The yard was fenced and temporary buildings for office and sales were erected. The necessary staff was appointed and the work was commenced. The opening ceremony of the market was performed by the Commissioner on the 10th March 1937. Correct weighment of cotton and auction sales have become the rule. 53,000 dokras of kapas, 2,200 dokras of lint were sold in the market yard during the season under report. The changes introduced in the regulated cotton market at Bailhongal were very much appreciated by the cultivators and arrivals increased considerably. It is hoped that this regulated cotton market will be a demonstration to others. Attempts are being made to apply the Act to Bijapur, Gadag and Nargund markets.

(31) *General District work.*—During the year under report, the grants for demonstrations continued to be very limited. The District Agricultural Overseers were instructed to conduct the demonstrations through the Taluka Development Associations and to utilise their limited funds of the Department in places where these Associations do not exist. Demonstrations of successful standing crops of selected strains

of cotton, paddy, jowar, groundnut, wheat and sugarcane in experimental plots continued to receive major portion of the attention of the District Agricultural Overseers all over the Division. As many as 84 demonstrations of paddy strains were conducted. This extensive work could be achieved with the help of the kamgars employed under Village Improvement Scheme sanctioned during the year. Village demonstrations on improved strains of cotton were almost equally extensive. Besides various crop demonstrations, sulphur dusting propaganda against smut in jowar and mango-hoppers and spraying with Bordeaux mixture against Koleroga on betelnut were continued to be done on an equally large scale. Spraying demonstrations against Koleroga were conducted in 101 villages where intensive work was carried. The demonstrations of the improved method of gul-making were mostly limited to the Chikodi tract, where a combination of Poona furnace and Kamatnur pan was used and 52 new furnaces were built during the year. The demonstrations of stone rollers and wheat-threshers were mostly limited to the eastern part of Dharwar and Belgaum districts. The Agricultural Engineer's improved seed-drill was demonstrated round Dharwar and Gadag. Preparation of charred bones was demonstrated in 27 centres. This extensive work was conducted through the help of the Revenue Officers. Mr. Hiremath, the Collector of Belgaum, continued to take keen interest in these demonstrations. In all 373 demonstrations of various nature were conducted during the year in the Division and the progress of Departmental work through these village demonstrations continued to be quite satisfactory. The other important district works were—multiplication and distribution of Pondicherry groundnut seed strain No. 8 and Pivala Kathya wheat seed strain No. 808. The seed raised on Dharwar Farm was multiplied in cultivators' fields and that grown by the seed-growers went for general distribution. 7,000 lbs. of reliable Pondicherry groundnut seed and 10,000 lbs. of pivala kathya wheat seed strain No. 808 have thus been distributed during the year and natural spread also took place to a considerable extent. The cultivation of onion as a second crop after paddy introduced by the Agricultural Department is gaining ground in Kanara district. Seed was produced in some cultivators' fields and distributed to others. Fruit culture is similarly extending in various parts of the Division. Cattle improvement was also a part of general district work. 21 bulls were purchased and located in different places under the Viceroy's Gift Bull Scheme.

(32) Fairly big agricultural and cattle shows held in the Division were—4 in Dharwar District, 3 in Bijapur District, and 1 in Karwar District. Series of lectures were arranged along with these shows and demonstrations on the subjects useful to the various tracts. His Excellency the Governor of Bombay was kind enough to pay a visit to these shows at Turkewadi and Garag.

(33) The Rural Uplift work undertaken at Kakhandki in the Bijapur District with the aid of the donation given by Mr. Shivappa Arli continued to be satisfactory. 3,020 acres of land were ploughed with iron

ploughs against 2,696 acres of last year. Jayawant cotton seed was stocked sufficient for 2,000 acres against 600 acres of last year, but due to want of rains much of the seed could not be sown. 180 acres were sown with Maldandi jowar strain No. 35-1. There was demand for bunding works; but the Bunding Officer could not be spared. The old breeding bull was sold and a new one was purchased. The fieldman of this Sanstha attended to various works including improvement of fruit gardens. The Education Committee is busy in opening a village library and night school and the Sanitary Committee in building 50 improved manure pits. The Agricultural improvement in 157 villages selected for Rural Uplift work by the Revenue Department in this Division with the aid of funds from the Government of India, continued to receive attention by the District staff of the Agricultural Department.

(34) *Propaganda against smut on jowar.*—The work was continued through the District Agricultural Overseers, the Revenue Officers and the Taluka Development Associations. The District Agricultural overseers continued to hold a number of demonstrations and showed the method of treating jowar seed with sulphur dust against smut. In all 3,996 packets of sulphur dust sufficient to treat the seed for 63,936 acres were distributed during the year.

(35) *Kanarese Agricultural Magazine.*—The propaganda through the Kanarese Agricultural Magazine was continued and many interesting articles were contributed by the officers of the Agricultural Department on different useful subjects. The Deputy Director of Agriculture continued to be the Chairman of the Publication Committee and Mr. S. G. Kadkol, Superintendent, Dharwar Farm, as Editor of the Magazine. Articles on important demonstrations and Village Improvement work also appeared in the Magazine.

C. Organisation.

(36) *Co-operative Sale Societies.*—The Hubli and Gadag Cotton Sale Societies continued to do their work on a fairly large scale. The Hubli Cotton Sale Society refused to accept the new Cotton Seed Multiplication Scheme, but Gadag did it. The Gadag Cotton Sale Society sold most of its cotton by auction sales, whereas the Hubli Cotton Sale Society by private treaty. Dharwar, Bijapur and Bailhongal Cotton Sale Societies also continued to do their work but on a smaller scale. The prices realised in auction sales of improved cottons were always higher than those in the market. Under the New Seed Multiplication Scheme sanctioned by the Indian Central Cotton Committee and the Government of Bombay, auction sales of improved cottons were encouraged in all cotton growing centres of the Division and they were very much appreciated by the cultivators. The Chilly Sale Union at Byadgi sold about 2,000 bundles of chillies.

(37) *Other Co-operative Societies.*—The Seed, Implement and Manure Societies are not doing any appreciable work. Cattle Breeding Societies

are realising the benefits derived by crossing country cows with Amrit Mahal bull. Technical management is still lacking. Better guidance continues to be a need. Sidenur Cattle Breeding Society did better work than others.

(38) *Destruction of prickly pear.*—The attack of Cochineal insect has now spread even to unapproachable places and the pear has altogether disappeared from most parts of the Southern Division. This is one of the greatest achievements of the Agricultural Department appreciated by the people of the Division from various points of view, including sanitation. In many places the prickly pear was the home of wild pigs and valuable crops were not safe. Now almost all the prickly pear has disappeared and pigs have left their homes to live in the interior forests.

(39) *Crop Protection Campaigns.*—The gun-clubs organised for protection of crops against wild pigs fared well and continued to do good work. The Arvatgi, Kalkeri and Hulkop-Galgi gun-clubs were outstanding in their merits and killed 92, 102 and 129 pigs respectively during the year. Two more gun-clubs were organised which make up the total of seventeen. In all 575 pigs were killed during the year and a good number was scared away. 85,000 acres of crops were protected by the operations of these gun-clubs, in the Southern Division and the cultivators were saved of a good deal of night watching. The work of these gun-clubs, therefore, is being very much appreciated, and applications for starting more gun-clubs are pouring in. The campaigns against wild deer were continued at Kaujageri and were organised also in five other villages of Ron taluka. An area of 29,000 acres was protected at an expense of Rs. 304. In all 140 deer were killed and a greater number was scared away.

(40) *Spraying Bordeaux mixture against Koleroga on betelnut.*—The scheme sanctioned by Government for Siddapur taluka was operated intensively and an area of 2,000 acres was sprayed against 1,615 of the last year. Loans issued to the cultivators for the purchase of sprayers and chemicals and to meet the wages of expert climbers amounted to Rs. 9,492 against Rs. 7,374 of last year. The work was organised in 101 villages against 88 of last year. Similar work was done in other talukas of the Kanara District also, but on a less intensive scale, and an area of 1,516 acres was sprayed specially in Honavar, Sirsi and Yellapur talukas. The total area operated, therefore, was 3,516 acres against 3,156 of last year and 2,678 and 1,441 acres of 1935-1936 and 1934-35 respectively. An attempt was made to inspect the crops sprayed and unsprayed in different parts of the district and yields were estimated. The benefits derived by the gardeners from spraying are calculated to amount to Rs. 1,23,060 at Rs. 35 per acre. There were good many difficulties in the way of work and propaganda was only weapon available to overcome them. With all the difficulties, the progress achieved has been quite satisfactory.

(41) *Taluka Development Associations.*—There are 15 Taluka Development Associations in the Southern Division,—7 in Dharwar, 4 in Belgaum, 2 in Bijapur and 2 in Kanara district. According to the classification made by the Divisional Board, 6 are in A class, 8 in B class and 1 in

C class against 8 in A, 5 in B and 2 in C class, last year. The total amount of subsidy given to these Associations was Rs. 5,469 during the year against Rs. 7,484 of last year. The work of these Associations continued to be fairly good. Two Associations have gone down from A to B while one has gone up from C to B class during the year. Many of these Associations did useful work in connection with the spread of Jayawant and Gadag No. 1 cottons, the use of sulphur dust against smut and extension of fruit cultivation. The financial position of many of these Associations continues to be unsound and it is getting very difficult to get willing subscribers. I must reiterate that the Co-operative Credit Societies must be asked to help these Associations and take more interest in their development.

(42) *Dharwar District Agricultural Association.*—The main work of this Association continues to be the publication of the Kanarese Agricultural Magazine and thereby to spread agricultural knowledge among the cultivators. The other activities of this Association are suffering and attempts are being made to induce the members to take more interest in the work of their Association.

(43) *Wilson Anti-famine Institute.*—This Institute at Bijapur continues to do good work in various directions. The depôts organised by the Institute sold implements, mainly iron ploughs and their spare parts worth Rs. 1,978 against Rs. 6,000 of last year. The fall was due to the bad season. The Institute purchased and stocked 2,000 bags of Jayawant cotton seed against 630 of last year, but due to want of rains only 500 could be distributed for sowing. 63 bags of 808 wheat seed and 92 bags of Rabi jowar—Maldandi strain 35-1—were distributed against 32 and 57 bags of last year respectively. Besides these the Institute distributed sulphur dust worth Rs. 112 and supplied two breeding bulls to two villages. Its Central Poultry Farm distributed 43 white Leghorn birds and 100 setting eggs. The Rural Uplift work undertaken by the Institute in nine centres was continued mainly in the direction of (1) hot weather ploughing, (2) cattle improvement, (3) better storage of farm yard manure, (4) introduction of improved seed, (5) poultry breeding, (6) sanitation, (7) education and (8) social matters. 122 improved new manure pits were constructed in 14 villages and 10 night schools have been opened. The nursery of the Institute raised and distributed seeds and seedlings worth Rs. 158. The work of the Institute even under adverse conditions of the year was good. The Collector of the District continued to be the President and Mr. A. S. Patil, District Agricultural Overseer, Bijapur, the Secretary of the Institute.

(44) The Divisional Board held its quarterly meetings regularly and guided the work of the Taluka Development Associations. The useful subjects discussed were (1) Cotton Ginning and Pressing Factories Act, (2) Improvement of gul in Mallad, (3) Potato disease and Mango-fly trouble at Belgaum, and (4) Improved method of preparing Farm Yard Manure.

(D) Direct Services to the Public.

(45) *Field embankments.*—The special post of Bunding Officer has not been restored. One Agricultural Overseer who was spared for this work continued to prepare plans and estimates. In all 41 schemes were prepared during the year for 800 acres against 51 for 840 acres last year. The total estimated cost of these was Rs. 19,000. 15 schemes out of 41 required tagavi loans amounting to Rs. 8,000 and the rest were financed by the owners of the lands themselves. In addition to the above, the Bunding Officer did some intensive work at Marewad and the Bunding Association organised there last year is doing good work. He also attended to the preliminary work on the Show ground at Belgaum. The demand for services on bunding is growing very wildly and I must reiterate that the special post of the Bunding Officer should be restored with adequate travelling allowance.

(46) *Work of Mechanical Assistant.*—The Mechanical Assistant was transferred to the control of the Agricultural Engineer and it is hoped that the work done by him during the year will be reported by that officer.

(47) *Tractor ploughing.*—The work of tractor ploughing for the removal of hariyali (a deep rooted weed) was continued by the Karnatak Agricultural and Transport Company. Canvassing was done by the Company itself. The Revenue Department gave tagavi loans to the cultivators and paid the amount direct to the ploughing firm on the recommendation of the Mamlatdars direct. The depth of ploughing was clear 12 inches and there was no complaint about it. The machinery used continued to be Mc-Cormick Deering Crude oil tractor of the trac-type named T. D. 40 of the Red Sack Deep Tillage three mould-board plough. The rate charged was Rs. 18 per acre. The area ploughed was 1,206 acres with the aid of tagavi loans and 545 acres against cash payment. The average output of work per unit per working day of 22 hours continued to be 8 to 10 acres. It is very pleasing to note here that the machinery mentioned above has proved its capacity to deal with the problem of removing hariali satisfactorily in the black soil. The organisation of Syndicates to take up this work under the guidance of expert advice and control is now being considered.

(E) Agricultural Education.

(48) The Vernacular Agricultural School at Devi-hosur completed its 23rd year. 35 applications were received for admission against 37 of last year. The number of students in the second year was 10 and 20 fresh students were admitted for the first year's class. Results of annual examinations continued to be satisfactory. 18 out of 19 in the first year and 8 out of 9 passed in the second year. The number of passed students of Devi-hosur school came to 301. The Association of these passed students formed in the year 1935 held its second annual general body meeting at Devi-hosur and discussed many important subjects.

They also met the Director of Agriculture, Bombay Presidency, Poona, during his visit to Devi-hosur school, who promised all possible help to this Association. They have organised there a co-operative credit society, a sale union, a library and a reading-room of their own. The health of the students continued to be good and their practical work on the farm was satisfactory. The social gathering was very successful and 24 past students attended it.

(49) Examinations of all the Agricultural Bias Classes were continued to be conducted by the District staff of the Agricultural Department. As the Inspector of Agricultural Schools was on leave and as acting arrangements were not made, the duty of occasional inspection of these schools also fell on the District Staff. It is desirable that all the District Local Boards who run these schools should make arrangements for inspection of these schools and relieve the District staff of the Agricultural Department to do more of their own work. A School or College to train teachers of these Agricultural Bias Classes continues to be a need.

(50) *Publications.*—A number of articles was contributed by the officers of the Agricultural Department in the Southern Division for publication in the Kanarese Agricultural Magazine, College Magazine, *Times of India* and local news papers. An article on "Lingayat cultivator" has been sent to the Agricultural Expert for publication in Agriculture and Live-Stock Journal of India.

General.

(51) The new cotton seed multiplication scheme described in paragraph (52) of the last year's report was brought into operation. Pure Jayawant seed covered an area of $1\frac{3}{4}$ lacs acres and Gadag No. 1 84,000 acres. The natural spread was estimated at about $1\frac{1}{4}$ lac acres and 20,000 acres respectively, making a total of about 3 lacs acres under Jayawant and 1 lac acres under Gadag No. 1 cotton. Pure Jayawant seed sufficient for $2\frac{1}{2}$ lac acres and Gadag No. 1 seed sufficient for 94,000 acres have been stocked for the next season. Besides these, the natural spread is likely to be more than that of the last year.

(52) The schemes for agricultural improvements through Village Improvement Funds mentioned in paragraph (53) of last year's report were operated during the year. Improved paddy seed covered an area of 24,386 acres. J. 213 cane was made popular in Mallad and H. M. 544 in Kanara. 1,277,125 cane sets of J. 213 and 185,000 sets of H. M. 544 were distributed during the year. 585 improved manure pits were constructed. 52 Poona-furnaces were built in the Belgaum District. The temporary Bunding Officer appointed in the Belgaum District prepared some schemes and supervised the bunding operations. The Implement Depôts were established in six places and different kinds of implements have been purchased for hiring purpose. The Rural Uplift Van was equipped with all exhibits, charts and models of agricultural nterest and the District Staff demonstrated the same in 129 villages,

according to the programmes prepared by the Collectors. All this was an additional work to the Deputy Director of Agriculture and his District Staff. Besides these the fresh schemes submitted to the District Village Improvement Committees were :—

Belgaum District.

1. Extension of pine apple cultivation.
2. Extension of Pivala Kathya wheat strain No. 808.
3. Popularising the improved method of preparing farm yard manure.
4. Extension of pomegranate cultivation in the Gokak Canal tract.

Karwar District.

5. Extension of onion cultivation.
6. Extension of Malbar variety of pepper cultivation.
7. Extension of graft-mango cultivation.
8. Extension of pine apple cultivation.
9. Supply of spraying machines to small betelnut gardeners on hire system.

(53) *The Karnatak Agricultural Show at Belgaum.*—In response to G. R., R. D., No. 7964/24 dated 6th August 1936, a move was made to organise a Karnatak Agricultural Show at Belgaum. A general meeting of the leading men of all the four districts—Dharwar, Belgaum, Bijapur and Karwar—was called by the Commissioner, S. D., on 10th March 1937. An Executive Committee and various sub-committees have been formed and budget estimates have been prepared. The Secretaries have been appointed to organise different sections of the Show. The Commissioner, S. D., is the Chairman and the Deputy Director of Agriculture, S. D., is the general Secretary of the Show. The District and Taluka Committees have been formed for collection of funds and exhibits. A show-office has been opened and the work is in progress. A site was selected in the Cantonment and various improved strains of crops are being grown. The Sectional Secretaries are busy in preparing their detailed plans and estimates. The progress achieved is being communicated to the public through Press, and the Show-Committee has issued two leaflets. The proposed Karnatak Agricultural Show is estimated to cost Rs. 65,000. The Presidency Show Fund Trust has been approached for a grant of Rs. 20,000 and it is proposed to collect the remaining amount of Rs. 45,000 locally in the four districts and from the adjoining States. The Presidency Show Fund Committee has at present given a grant of Rs. 10,000 and the local subscriptions have amounted to about Rs. 20,000 so far. Further collections are in progress. All possible attempts are

being made to make this Karnatak Agricultural Show as interesting and educative as possible.

(54) The Divisional Conference of the Officers of the Agricultural Department in the Southern Division could not be held during the year owing to want of Travelling Allowance grants.

(55) Besides all the above routine and additional work, the Deputy Director of Agriculture attended Railway Board, Indian Central Cotton Committee, Forest Advisory Committee and District Village Improvement Committee meetings in various places. He worked for the application of Cotton Market Act at Bailhongal, Bijapur, Gadag and Nargund.

(56) His Excellency the Right Honourable Lord Brabourne, G.C.I.E., M.C., the Governor of Bombay, visited Dharwar, Belgaum and Kanara districts and inspected various agricultural works of the Division, among his other engagements. Sir D. B. Cooper, Kt., the Honourable Revenue Member and Sir S. T. Kambli, Kt., the Honourable Minister for Agriculture also visited and saw the various activities of the Agricultural Department in the Southern Division. Mr. W. J. Jenkins, M.A., B.Sc., I.A.S., the Director of Agriculture, B. P., Poona, toured in Dharwar, Belgaum and Karwar districts and inspected both Research and Propaganda works of the Department in various places. He met cultivators in different tracts and discussed their problems.

(57) The activities of the Agricultural Department in the Southern Division have much extended especially in the direction of the spread of improved varieties of cotton, paddy and sugarcane crops and organising gun-clubs against attack of wild pigs. The special schemes referred to in Paragraph (52) and the Karnatak Agricultural Show work referred to in paragraph (53) have brought considerable additional work. The clerical staff in the office of the Deputy Director of Agriculture is required to be considerably increased. All the members of the staff except a few continued to do good work. Many Revenue Officers and private gentlemen continued to help our agricultural propaganda and organisation work and my thanks are due to them. My special thanks are due to the Collectors of all four districts who gave me all the help needed.

S. S. SALIMATH,
Deputy Director of Agriculture,
Southern Division, Dharwar.

Programme of work under the Deputy Director of Agriculture, Southern Division, Dharwar, for 1937–38.

(*A*) *Research and Experiments*—

(1) *Cotton Breeding work*—

Selfing of Jayavant and Gadag No. 1 cottons will be continued for multiplication of seed required for 9 centres according to the new scheme sanctioned by the Indian Central Cotton Committee and the Government. Different cottons will be tested for wilt resistance both in the field and the green house. Selection in important new crosses will continue. The New Jayavant 15 cross will be compared with Jayavant and Kumpta and Gadag No. 1 X Co 11 cross will be compared with Gadag No. 1 cotton for yield.

(2) *Jowar breeding work*—

Fulgar yellow, Fulgar white, Nandyal, Bilichgan and Savaner selected strains of jowar will be maintained by selfing and grown on Dharwar Farm to meet the needs of the cultivators.

(3) *Groundnut breeding work*—

Spanish peanut variety of groundnut strain No. 5 and Pondichery variety strain No. 8 will be grown on the farm to produce seed for distribution in the District. Selection in other promising varieties will be continued.

(4) *General Experiments on Dharwar Farm*—

All the important varietal manurial and rotational experiments will be continued on jowar, cotton, wheat, tobacco and other dry crops. San green manuring experiment has been modified. Jowar varietal experiment artificial manurial experiments on jowar and cotton and a few others the results of which are conclusive have been dropped and a few new cultural experiments have been added.

(5) *General Experiments on Gokak Farm*—

Under crop experiments sugarcane, cotton and tobacco varieties will continue to be compared. Under manurial experiments different dozes of artificial manures on sugarcane will be repeated. Selection in maize and wilt resistant tur will be continued. Fruit-gardening with its nursery will continue to receive increased attention.

(6) *Rice Breeding work*—

Selected strains of Mugad and Antersal varieties of paddy will continue to be multiplied on Mugad Farm. Selection in Dodgya variety of paddy will receive major attention. Selection in local fine rices will also be continued. Botanical

study on the cross between gonag and cultivated rice will be persued. On Kumpta farm selected strains of Jeddu, Maskaty and Red Halga strains will continue to be multiplied. Selection in Upghat white Halga variety of paddy will be continued whereas that in salt land Kagga paddy will be discontinued as resistance to flood does not seem to be a hereditary character. Manurial experiments on paddy and sugarcane will be repeated and different varieties of sugarcane will be compared. The cultivation of cocoanut as dry crop will continue to receive attention. Pine-apple cultivation will be extended and methods of inducing more suckers to kew variety will be tried.

(7) *Experiments in Cultivators' fields*—

Selected strains of cotton, jowar, paddy, wheat, sugarcane and groundnut will be compared with local in different places of the Division where required. Artificial manures will be tested on sugarcane, paddy and betelnut crops. The plan of manurial experiments on betelnut crop in Kanara District was sent to the Statistician to the Imperial Council of Agricultural Research and has been got approved.

(*B*) *Propaganda*—

(8) Demonstrations of improved implements especially wheat thresher, stone-roller, ground-nut-digger and improved seed-drill and those of successful experiments on Government farms and in cultivators' fields will continue to be held as usual. Farmers' Weeks on Government Farms will be started. Spread of Jayavant and Gadag No. 1 cottons will receive major attention. Attempt will be made to stop illicit import of inferior cotton into the protected areas by improving the operations of the check stations and by detecting the carts on Kachha roads where check stations have not been established. Spanish peanut and Pondicherry improved strains of groundnut will be multiplied and distributed in various parts of the Division. The cultivation of mixed crops like maize and tur and maize and cambodia cotton will be extended in the Gokak canal tract. Bunding and fencing works will receive due attention. The Karnatak Agricultural Show to be held at Belgaum in January next will receive major attention of the Deputy Director of Agriculture. The rural uplift work at Kakhandiki and the villages selected by the Revenue Officers will be continued and will be intensified in Saswihalli group of villages where we have found a keen worker Mr. Shivangouda Patil.

(*C*) *Organisation*—

(9) The Hubli and Gadag Cotton Sale Societies have agreed to accept the conditions of the new scheme and our close work

with them will be continued. Our work with agents in the remaining seven cotton centres will be developed. Crop protection campaigns against wild pig and deer will be extended and more gun clubs of Arvatgi type will be started. Attempts will be made to organise syndicates for tractor ploughing to remove hariali, a deep rooted weed, in the black soil of Karnatak.

(10) The existing Taluka Development Associations will be guided to work according to the programmes drawn for them and the new Association at Halyal will receive special attention. The Dharwar District Agricultural Association will be revived and the Bijapur Antifamine Institute will continue to receive close guidance.

(11) The work of spraying against Koleroga on betelnut will be extended according to the scheme and research work sanctioned by Government will be taken up.

(12) The Cattle Breeding Societies will be advised to devote more attention to the technical work and sub-committees suggested by the Director of Agriculture will be organised in each District to consider all matters relating to the progress of His Excellency the Viceroy's Gift Bull Scheme.

S. S. SALIMATH,
Deputy Director of Agriculture,
Southern Division, Dharwar.

APPENDIX F.

Summary of work done under the Deputy Director of Agriculture, Gujarat, Surat, for the year 1936–37.

I. STAFF.

On the appointment of Mr. B. S. Patel as officiating Director of Agriculture, Bombay Presidency, Mr. G. P. Pathak held charge of the office of the Deputy Director of Agriculture, Gujarat, Surat, in addition to his own duties as Cotton Superintendent, Surat, from 19th August till relieved by Mr. G. P. Patil on 27th November 1936. I took charge on 18th May 1937 from Mr. G. P. Patil who reverted to his original post as Divisional Superintendent of Agriculture, Deccan Canals, Baramati.

2. Mr. C. S. Patel retired from 25th July 1936 and Mr. G. P. Pathak was confirmed as Cotton Superintendent, Surat. He had to proceed on one month's leave on medical ground and Mr. H. M. Desai officiated from 8th March to 7th April 1937.

3. Mr. G. B. Patel returned from abroad after completion of his study leave and resumed his office as Cotton Breeder, Viramgam, on 1st October 1936.

II. SEASON.

4. The monsoon broke out by the middle of June and the sowing of all kharif crops was over by the end of the month. The month of August passed off practically without any rain in the whole division and the conditions in Broach, Panch Mahals and part of Ahmedabad were very disappointing. Fortunately a severe famine was averted by a heavy rainfall in mid September throughout Gujarat. The whole of October was again dry and very hot but the situation was relieved by a general fall in November, thus the rainfall was much below normal. The cereal crops practically failed in North Gujarat and yielded very little where they had survived. Cotton, groundnut and tobacco also suffered considerably except at Surat and Broach. Wheat was affected heavily by rust and the season was, on the whole, bad for all crops and especially so in parts of Panch Mahals where famine conditions prevailed.

III. RESEARCH AND EXPERIMENTAL WORK.

(1) Crop Breeding.

Surat.

5. *Cotton—Replication tests.*—1027 A.L.F., B.D. 8 and S_3 V_3 (Selection 3 of Vernalization treatment 3) were tested for yield in eight randomized replications the area under each plot being 1·37 gunthas. No type was significantly superior to the general mean.

B.D. 8 and S_3 V_3 gave higher yields than 1027 A.L.F. by 3·7 per cent. and 3·4 per cent. respectively, while the ginning percentage was lower by 0·9 and 1·2 respectively; thus the lint outturn per acre in all the three types was nearly the same. B.D. 8 was shorter in length than 1027 A.L.F. by 0·06″ or roughly 2 mm.

6. *Spinning tests.*—According to the spinning tests of 1936–37 the types 1027 A.L.F., S_3 V_3 and B.D. 8 have been adjudged suitable for 26's, 30's and 36's warp counts respectively.

The graders value 1027 A.L.F. as superior on account of its silky feel and good colour although it is pronounced to be capable of spinning only 26's. They consider 22–3–2 cotton as next best although it is capable of spinning as high as 40's. They value B.D. 8 still less though it is capable of spinning 36's i.e., 10's more than 1027 A.L.F.

7. *Crosses.*—Selection was continued in crosses including the composite cross (B.D. 8 × I A.L.B. × 1027 A.L.F.) and back crosses further crossing i.e. a back crossing second time with 1027 A.L.F. was done to get higher spinning while retaining the fibre characters of 1027 A.L.F., particularly the feel. The back crosses in which Gaorani 6 is one of the parents are retained; while F_2s were rejected. This was also done in the case of 22–3–2 cross.

22–3–2 gives a very high spinning value viz., 40's. It has also a longer staple than 1027 A.L.F.; however its colour is inferior. Besides as it gives lower ginning outturn it cannot replace 1027 A.L.F. unless low ginning is compensated by a high premium for better spinning. Another promising culture is I A.L.B. cross 8–1 which is found to be capable of spinning 35's with a staple length little longer than 1027 A.L.F.; this has also very high ginning percentage i.e. only about 1 per cent. lower than I A.L.B. Both these are being tested for yield with 1027 A.L.F. and the promising selection 16.

8. *Fresh crosses.*—With a view to combine high spinning and other economic characters such as high ginning fibre characters and wilt resistance the following new crosses are done :—

(1) 22–3–1 × 1027 A.L.F.

(2) 22–3–1 × Selection 16.

(3) 1027 A.L.F. × (B.D. 8 × N.S. 12 × 1027 A.L.F.).

9. *Inter-specific crosses.*—Ten hybrids of last year were maintained as ratoons. As a result of fresh crossing in 1935–36 ten more were added. One back cross plant was obtained by crossing the American parent with the hybrid pollen. In all 41 seeds from the hybrids and 17 seeds from the back cross plant have been obtained during the year under report.

10. *Selections.*—Of the two promising selections of 1932–33 No. 16 gave a ginning outturn higher than 1027 A.L.F. by 3·4 per cent. on an average of last four years. It is however shorter in fibre length than

1027 A.L.F. though longer than B.D. 8. On an average of last three seasons it is found to spin about 2 counts more than 1027 A.L.F. This year it was suitable for 29's against 26's of 1027 A.L.F.

Selection No. 9, though longer in staple than 1027 A.L.F. in some years is inferior in spinning value to 1027 A.L.F.

From fresh selections in 1935-36 three have been retained. Fresh selection is done by growing cotton seed samples from South Surat tract on a large scale ; 12 plants having good fibre characters are selected. 25 plants showing wilt resistance in cultivators' fields of Olpad Taluka are selected for further trial.

11. *Seed production.*—Selfed seed 488 lbs. of 1027 A.L.F. and 20¾ lbs. of B.D. 8 was produced of which 424½ lbs. of the former and 16½ lbs. of the latter were supplied to the Superintendent, Surat Farm, for multiplication. 40 lbs. of 1027 A.L.F. seed was given to Baroda State as a basic stock for seed multiplication to be carried out in their own territory.

12. *Experiment to economise selfed seed in dibbling.*—Dibbling at normal sowing time at 1½" depth by using three and four seeds against the local practice of using large number of seeds dibbled shallow was practised during the year. The season was favourable for germination. The percentage of germination was 87·4 and 91·3 with 3 and 4 seeds respectively. The percentage of gaps was nearly the same viz., 2 per cent. in all including the local method.

13. *Vernalization.*—The experiment was continued with treatment No. 3 only. The germination was adversely affected as compared with previous years. But though there were many gaps in the field, the yield per acre of treated seed was higher by 6 per cent. As the crop was not early the experiment is dropped by the Economic Botanist.

14. *Jowar.*—Selections were maintained pure by selfing. 22¼ lbs. selfed seed was produced of which 18 lbs. have been supplied to Superintendent, Surat Farm, for multiplication.

Broach.

15. *Cotton.*—This is the fifth season of cotton work which is financed by the Indian Central Cotton Committee.

Crosses.—Two of the crosses viz., B.D. 8 × G.A. 26-F_6 and B.D.$_8$ × (B.D. 8 × G.A. 26-F_1) F_4 were grown on a fairly large scale this year and studied in details for wilt incidence and economic characters. Of the 9 promising segregates reported last year from B.D. 8 × G.A. 26-F_5 segregate 76 has given relatively more stable performance than the rest. All the 14 single plant progenies of this segregate grown in duplicate plots are fairly uniform individually with more or less identical performance. The range of ginning between them is only from 36·7 to 40·1 per cent. while that of staple length is from 21·3 to 23·1 mm.

The fibre feel in all progenies is on the whole superior to that in B.D. 8. Eight progenies did not show any wilt while six had only 1·4 to 4·5 per cent. root discolouration. Six best progenies have been finally selected for testing their uniformity regarding wilt and economic characters in randomised replications next season. Of the 8 segregates from the back cross B.D. 8 × (B.D. 8 × G.A. 26-F_1) F_3 of the last season, segregates 1, 5 and 6 were grown in two different plots with 10, 8 and 8 progenies respectively. The results of the year under report indicate that the segregate 1 which had 36·7 per cent. ginning, 23·4 mm. fibre length and 5·6 per cent. root discolouration only has given rather fairly uniform performance. The mean performance of segregate 5 was 38·9 per cent. ginning 22·8 mm. staple length and no wilt. It appears to be more homozygous for fairly high ginning and medium staple length; two cultures are kept for further tests of purity.

As compared to segregate 1, segregate 6 has given better performance for staple length. Its performance of the past season was 36·9 per cent. ginning, 22·0 fibre length and no wilt. These three have been finally selected for further tests.

In the remaining 13 crosses, selections of the desirable combinations in ginning 36 per cent. and above and fibre length 22 mm. and above have been finally made and a few best plants from each have been retained for further generation.

16. Out of several selections from the local studied so far only N.S. 12 and N.S. 49 have been found worth retaining. N.S. 12 is highly resistant to wilt, gins on an average 39 per cent., and spins 28's. For yield it is being tested along with B.D. 8 since 1935-36. N.S. 49 is also as good as N.S. 12 as regards resistance to wilt. It gins about 35 per cent. and is estimated to spin up to 30's but lodges badly during rain storm due to its height and growth habit. It is also susceptible to jasside attack.

Periodical observations on wilt incidence in hybrids, parents, selections and fixed types were taken as usual. This season wilt attack was very mild and not very clear due to low rainfall with uneven distribution.

17. *Seasonal wilt incidence.*—As usual the study of seasonal variation in wilt incidence was continued by growing the same susceptible type I A.L.B. on the same plot. The results of previous seasons and particularly of the current one reveal that the plot has been thoroughly infected with wilt organism and the experiment need not be continued.

In all eleven fixed types six Goghari, three Deshi, $B9_1$ and N.S. 12 were maintained as usual by selfing.

18. *Replication trials.*—B.D. 8 and N.S. 12 were tested for yield in 6 replications of one guntha each. Last year N.S. 12 yielded slightly more but not significantly. This year its yield is very high. Low yield of B.D. 8 is due to unfavourable season.

19. *Seed multiplications.*—B.D. 8 was grown on an area of 2¾ acres for seed supply. About 900 lbs. pure seed was supplied for seed multiplication and extension scheme in the District.

20. *Inter-specific crosses.*—The old hybrid "Amer-Ind" of 1933 is maintained as such and also by layerings and cuttings. Back crossing with Hirsutum has resulted in 2 F_1 plants of which one set a boll with a single seed only. By fresh attempts 3 more hybrids have been obtained.

Nadiad.

21. *Tobacco.*—A type with a smaller and thicker leaf than either P-45 or 11-6-2 is needed for the Piliu tract and hence fresh selections have to be done.

Keliu variety:—43 selections of the previous year were studied by increasing them into 75 sub-cultures to ascertain the uniformity and comparative yield. 20 cultures have been retained for further study. Besides the best 5 cultures were tested in 6 replications along with local by Latin square method. One selection No. K-49 has given 14 per cent. higher yield though the result is not statistically significant.

White Burley × P-45 cross was studied over 21 cultures and hybrid vigour is seen to continue in one family.

22. The best method of raising seedlings was found to be in the use of covers over the beds. The application of copper sulphate (at the rate of 12 lbs. per guntha of seed bed) applied 24 hours before sowing the seed proved very effective in checking the damping off disease.

23. *Cigarette tobacco.*—(A) *Yield.*—On a non-tobacco plot of one acre Harrison Special yielded 1,350 lbs. and on an old tobacco plot it yielded 575 lbs. of cured leaf. The comparative trials of G-6 under low nipping at 14 leaves for use in Bidies and the hybrid N-10-3 under tall nipping at 18 leaves for cigarettes were taken; G-6 for Bidies yielded 950 lbs. and N-10-3 for cigarette yielded 885 lbs.

(B) *Curing.*—By the combined method of yellowing the leaf in an additional room, under natural temperature and then completing the curing in the barn, the time for which the barn is occupied under direct loading is reduced by about 48 hours or nearly half the time and the cost for fuel, labour and supervision is also reduced by about 0–0–4 per lb. of dry leaf.

The cost of curing was thus reduced this year to 0–2–3 per lb. of dry leaf including the supervision charges of a trained curer as against 0–2–9 of last year without supervision charges. In all 3,750 lbs. of cigarette leaf were cured. The method of curing the quality

grades and the rates offered by the established manufacturers, the Golden Tobacco Co., Bombay, have been as under in comparison with Bidee leaf of G. No. 6 :—

Variety.	Method of curing.	Yield per acre grades.		Per cent. by grade.	Valuation in annas per lb.	Remarks. Sale rate Average per lb.	Cost of curing.	Net return.
						Rs. a p.	Rs. a. p.	
Harrison Special.	Flue curing ..	I	864	25	8			
		II	1,556	46	4	0 5 0	0 2 3	129
		III	168	5	3			
		IV	784	24	3			
	Sun curing ..	I	157	48	6			
		II	329	23	5	0 4 0	0 1 3	129
		III	50	8	3			
		IV	149	21	2			
Gandiu No. 6..	Sun curing ..		1,000	..	Rs. 5 per maund.	0 2 0	0 0 8	85

The valuation this year has been 0–0–9 less per lb. than in the previous year for the flue cured tobacco and 0–2–0 less for the sun cured tobacco. The market fluctuations are mainly responsible although the strong heat of this season has, to some extent, affected the leaf quality.

The difference in the Bidee and cigarette tobaccos is thus Rs. 44 in favour of the latter. The depreciation at 4 per cent. and interest at 6 per cent. for the barn worth Rs. 1,250 useful for curing a crop of 4 acres works up at Rs. 34 per year leaving a margin of profit of Rs. 10 per acre this year for cigarette tobacco as against the local use of tobacco. In sun curing under shade however the cost of barn and consequently the amount of interest and depreciation would be much less leaving a wider margin of profit a point which is being actually worked at present.

24. *Bajri Breeding.*—The types 207 and 206 along with local were studied in six replications. The area of each plot being one guntha. Both the types were found significantly superior to local in yield to the extent of 22 per cent. and 20 per cent. respectively. During the previous two years type 207 had yielded about 13 per cent. significantly superior to local and it might now definitely be taken to be superior to local by 13 per cent. only. No. 206 follows next in order of merit and may be of use for crossing at a subsequent stage.

25. *Castor Breeding.*—Type S-9 was found yet to split and will be discontinued. S-20 is now practically pure for stem colour and double bloom. The spikes contain about 74 per cent. female flowers against 56 per cent. in the local. In replication trials it has given about 13 per cent. higher yield than the local from Prantij. It is appreciated by growers of Kaira and Panch Mahals.

Similarly S-5 is by now absolutely pure for stem colour and double bloom. For the female composition of the spike however it is not so high as S-20. It is late by about a fortnight as compared to S-20 and carries a large seed size.

Viramgam (Ahmedabad District.)

26. *Cotton—Replication tests.*—The chief object is to have a type of Wagad cotton appreciably superior to the local in spinning value (i.e., about 25's warp with 2·3 per cent. higher ginning and better yield). Two promising segregates, viz., 4–1 and 7–1 of the cross Wagad 8×1027 A.L.F. were continued in comparative tests with Wagad 8 and local Wagad in five random replications, the area of each plot being 1·93 gunthas.

The following table shows the results :—

Type.	Yield per acre in lbs.		Ginning Percentage.	Spinning value.		
	Kapas.	Lint.		1933–34.	1934–35.	1935–36.
Local Wagad	91	27	29·8	18	16½	12
Wagad 8	117	40	34·0	17	14	12
4–1	62	23	36·9	24	20	14
7–1	81	31	38·8	..	28	18
Difference to be significant ..	25	10	1·5	..	..	..

The yields are too poor to be of any comparative value. Wagad 8 is significantly superior to the rest in Kapas yield, and to local and 4–1 in lint yield. The low yields of Kapas of segregates 4–1 and 7–1 are partly made up by their high ginning percentage and the differences in lint as compared to local are not significant. Both the strains gave considerably low spinning value in 1935–36, it being a dry year. This year's result are awaited.

Boll opening of strain 7–1 is much wider than ordinarily required for the tract. The future of both the types depends on their spinning performance which will be judged by future trials.

27. *Jowar.*—Jowar breeding has been started from the year 1930–31 with a view to improve the yield and quality of fodder and grain of the two important fodder varieties, viz., Chhasatio and Utavali. The crop failed due to drought during the year under report. The types isolated will be tested next year from the seed preserved.

28. The Cotton Technological Assistant is maintained from the funds of the Indian Central Cotton Committee. He helped the Breeders at Viramgam, Broach and Surat in examining 800, 1,787 and 1,093 samples respectively ; in addition to these, 104 samples were examined for fibre length, fibre weight and maturity. Besides 9 samples were tested for fibre strength. During the year under report standard hair weight was calculated for a number of samples and values supplied to Breeders thus giving them one figure combining maturity and fibre weight.

(2) Experimental Station Work.

(a) *Surat Agricultural Station.*

29. *Seed multiplication.*—Cotton 1,027 A.L.F. was grown on 58 acres and 26 gunthas giving 528 lbs. of seed cotton per acre. 19,800 lbs. out of the resultant seed was distributed in selected villages of Surat seed groups for further multiplication and distribution of which 9,819 lbs. were of stage II and 9,981 lbs. of stage III. Again 700 lbs. of second stage were supplied to Baroda State to serve as a basic stock for a similar scheme in the State territory. B. D. 8 was grown on 9 acres and 27½ gunthas and the resultant seed 288 lbs. of stage II and 1,728 lbs. of stage III was supplied in Broach District for B. D. 8 extension scheme financed by the Indian Central Cotton Committee.

30. Jowar Budh Perio No. 53 was grown on 50 acres and 9 gunthas giving 811 lbs. grain per acre. 12,957 lbs. of this pure seed were distributed in the District through the Cotton Superintendent, Surat, and 3,702 lbs. were distributed directly from the Farm.

31. *Cotton on high vs. low ridges.*—The experiment was carried out as described in previous years' annual reports. Farm yard manure at the rate of 10 cart-loads per acre was given. There was no difference in germination as the season was favourable. The percentage increase in yield over control (ordinary flat) is as under :—

Treatments.	Percentage increase or decrease over control.
1. Flat with interculturing by a shovel cultivator	— 1·05
2. Low ridges	11·11
3. High ridges	12·39
4. High ridges with interculturing by a Disc-harrow ..	15·64

High ridge with Disc-harrow is significant over general mean and (A) Low ridge (B) High ridge (C) High ridge with Disc are significant over ordinary flat and flat with shovel.

32. *Manurial Experiment (Sulphate of ammonia).*—The experiment reported in paragraph 33 of last year's report was continued. This being the fifth year of the experiment. The percentage increase or decrease of yield over control in no-manure is as under :—

Treatment.	Yield per acre in lbs.	Percentage increase or decrease over control.	Extra cost of manure and manuring over control.	Value of increase or decrease over control.
			Rs. a. p.	Rs. a. p.
1. No-manure	375·91	....	....	....
2. 10,000 lbs. F. Y. M. once in six years ..	353·83	—5·88	....	—2 14 4
3. 10 lbs. N. in the form of Sulphate of ammonia at sowing	326·9	—13·04	5 2 7	—6 6 11
4. 20 lbs. N. in the form of Sulphate of ammonia at sowing	341·35	—9·19	8 3 3	—4 8 7
5. 40 lbs. N. in the form of Sulphate of ammonia at sowing	484·90	28·99	14 4 3	14 4 11
6. 10 lbs. N. in the form of Sulphate of ammonia after stand	428·47	13·98	5 7 7	6 14 5
7. 20 lbs. N. in the form of Sulphate of ammonia after stand	478·96	27·41	8 8 3	13 3 5
8. 40 lbs. N. in the form of Sulphate of ammonia after stand	682·11	81·45	14 9 3	40 3 2

The whole cost of Farm yard manure was taken into account in 1932–33.

The results of the experiment are significant.

40 lbs. N. after stand is significant over all and general mean.

20 lbs. N. after stand and 40 lbs. N. at sowing are significant over 10 lbs. N. and 20 lbs. N. at sowing, Farm yard manure and no-manure.

33. *Residual effects of manurial treatments to cotton on next jowar crop.*—In grain yield 40 lbs. N. after stand is significant over 40 lbs. N. at sowing and 20 lbs. N. after stand. Farm yard manure is significant over 10 lbs. N. at sowing, 40 lbs. N. at sowing and 20 lbs. N. after stand.

In fodder 40 lbs. N. after stand is significant over all and general mean. This shows that 40 lbs. N. after stand gives an increase yield of cotton and jowar. Other treatments have little residual effects.

34. *Spacing Experiment.*—The experiment reported in paragraph 34 of last year's report was continued and the results are as under :—

Treatment.	Yield in lbs. per acre.	
	Dibbling.	Drilling.
1. 3′ × 3′	366·52	435·05
2. 4′ × 3′	402·71	435·05
3. 4′ × 2′	370·15	424·60
4. 5′ × 2′	404·91	413·05
5. 6′ × 2′	481·14	431·31

The figures of yield are significant statistically. Dibbling 6′×2′ is significant over general mean, dibbling 3′×3′, 4′×3′, 4′×2′, 5′×2′ and drilling 5′×2′.

Drilling { 3′×3′, 4′×3′, 6′×2′ } are significant over dibbling 3′×3′ and 4′×2′.

35. *Residual effects of wider spacing of cotton on next jowar crop.*

Grain—None of the treatments is significant over general mean.

Dibbling and Drilling { 4′×2′, 5′×2′ } are significant over dibbling 3′×3′, 4′×3′, 6′×2′ and drilling 4′×3′.

Drilling 6′×2′ is significant over dibbling 6′×2′, 3′×3′.

Drilling 4′×2′ is significant over dibbling 6′×2′.

Wider drilling seems to give better results.

Fodder.—Dibbling 5′×2′ is significant over dibbling 3′×3′.

36. *Cotton green manuring experiment.*—The experiment reported in paragraph 36 of last year's report was continued.

Dhaincha plants were buried in soil when they were 1¼ months old. Their weight was as under :—

With manure.—7,114 lbs. green matter per acre.

Without manure.—6,018 lbs. green matter per acre.

The yield results are as under :—

	Treatment.	Yield of seed cotton per acre in lbs.	Percentage increase over control.
1.	Cotton (Control)	450·08	....
2.	Cotton *plus* Farm yard manure	480·64	6·79
3.	Cotton *plus* Farm yard manure *plus* Dhaincha	587·22	30·47
4.	Cotton *plus* Dhaincha	546·18	21·35

Cotton plus Farm yard manure *plus* Dhaincha is significant over control but not general mean.

37. *Residual effects on green manuring in cotton on next jowar crop.*—

Grain.—Dhaincha *plus* Farm yard manure is significant over control.

Fodder.—Dhaincha alone and with Farm yard manure is significant over control but not over general mean.

38. *Green manuring experiment for jowar.*—The experiment reported in paragraph 38 of last year's report was carried out.

Dhaincha plants were buried in soil when they were 40 days old. Their weight was as under :—

With manure.—22,978 lbs. green matter per acre.

Without manure.—20,146 lbs. green matter per acre.

Due to deficient rains after sowing the yields are much less. The yield results are as under :—

	Treatment.	Yield of grain in lbs. per acre.	Per centage increase or decrease over control.	Yield of fodder in lbs. per acre.	Percentage increase or decrease over control.
1.	Control (No-manure) ..	978·92	....	4,684·54	....
2.	Jowar—Farm Yard Manure	938·93	— 4·08	4,978·65	6·25
3.	Jowar—Farm Yard Manure *plus* Dhaincha.	742·12	—24·18	3,003·99	—35·87
4.	Jowar—Dhaincha ..	783·48	—19·96	2,898·95	—38·12

Grain.—Farm yard manure and control are significant over Dhaincha alone and with Farm yard manure but not over general mean.

Fodder.—Farm yard manure and control are significant over Dhaincha alone and with Farm yard manure and general mean (due to less rainfall).

39. *Residual effects of green manuring in jowar on next cotton crop.*—The yield results are as under :—

Treatment.	Yield of seed cotton per acre in lbs.	Percentage increase or decrease over control.
1. Control (No-manure)	458·63	....
2. Farm Yard Manure	459·29	0·14
3. Farm Yard Manure *plus* Dhaincha ..	656·26	43·09
4. Dhaincha	601·34	31·15

Treatment No. 3 is significant over all and general mean.

Treatment No. 4 is significant over 1 and 2 but not over general mean.

40. *Rotational Experiment.*—The experiment as detailed in paragraph 40 of last year's report was continued.

The average weight of green stuff buried per acre was 24,742 lbs. and its height was 28·4 inches when 78 days old.

The yield results are as under :—

Treatment.	Yield of seed cotton in lbs. per acre.	Percentage increase or decrease over control.
(B) Cotton after green manure fallow ..	1,053·02	131·91
*(D) Cotton after jowar	419·07	— 7·7
*(F) Cotton after jowar	462·82	1·93
(G) Cotton after jowar (control, i.e. no-green manure).	454·07	....

*The difference in these treatments is in the cycle of rotation planned for 6 years.

(B) Cotton after green manure is significant over all and general mean.

41. *Residual effects on next jowar crop.*—The results are as under :—

Treatment.	Yield of grain in lbs. per acre.	Percentage increase or decrease over control.	Yield of fodder in lbs. per acre.	Percentage increase or decrease over control.
(H) Jowar after cotton (control).	813·25	....	2,411·36	....
(C) Jowar after cotton after green manured fallow.	847·28	4·18	4,441·56	84·24
(E) Jowar after cotton ..	767·24	—5·55	2,644·71	9·34

Grain—Treatment C is significant over H but not over general mean.

Fodder—Treatment C is significant over H, general mean and E.

42. *Trial of defibrated cotton seed.*—It was reported that defibrated seed requires no besmearing with mud for drilling purposes—unlike raw seeds and hence this trial was carried out. There was no difficulty in drilling the seed but the germination capacity in all the three types was defective as could be seen from the following statement. However the trial will be continued for another year; white and black cotton seeds had the lowest field germination.

Kind of seed.	Germination per cent. in blotting paper.	Field germination of seed sown on 4th July 1936.			Final stand.
		9th July 1936.	14th July 1936.	21st July 1936.	
1. Black seed (completely defibrated.)	64·0	70·0	87·33	86·0	83·33
2. Semi black seed. (Partially defibrated.)	64·5	75·0	85·42	88·2	87·5
3. White and black. (Very little defibrated.)	72·5	61·11	75·0	76·4	77·08
4. Raw seed (Control.) (Not defibrated at all.)	88·5	90·0	99·3	99·3	97·22

43. *Surat Dairy.*—The strength of the herd on 1st April 1937 was 115 as against 90 of last year. The health of the herd remained very good. Mortality was very low as there was only one death during the year. The milk production and realisation from the sale of Dairy produce during the years 1935–36 and 1936–37 were as under:—

Year.	Total milk in lbs.	Average number of adult cows in the year.	Annual average per cow in lbs.	Total realization.	Average rate in lbs. per rupee.
1935–36 ..	87,775·0	35·5	2,472	6,066	14·47
1936–37 ..	73,621·12	33·3	2,211	5,729	12·85

(*b*) *Broach Farm.*

44. *Manurial experiments.*—The following three treatments have been given to the cotton crop since last five years and compared with no manure:—

(1) 4 cart-loads of Farm yard manure per acre.
(2) Sann sown and buried in the middle one foot strip.
(3) Besides treatment No. 2, 10 lbs. N. in the form of sulphate of ammonia given at the time of sowing at a distance of 6″ on either side of cotton rows.

Residual effects of these treatments on the rotational crop of jowar have also been studied. The experiment has put in a cycle of five years and will therefore be dropped from the next season.

The following is the summary of results :—

Series I—Cotton.

Year.	Yield of kapas in lbs. per acre.				Quantity of green matter in lbs. buried in plots under treatment 2	Rainfall in inches.
	Treatment.			Control.		
	(1)	(2)	(3)	(4)		
1932–33	535	507	553 S	503	...	32·45
1933–34	473 S	431	478 S	425	1,090	32·78
1934–35	520 S	445 S	556 S	362	1,151	27·01
1935–36	432 S	378	362	364	800	21·39
1936–37	420 S	358 S	453 S	297	3,525	22·46
Average ...	476	424	481	390	..	..

S = Difference significant.

Series II—Jowar.

Residual effects of the above treatments on jowar crop :—

Year.	Yield of grains per acre.				Yield of fodder per acre.			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
1933–34	890	830	810	813	1,802	1,678	1,735	1,689
1934–35	780 S	557	538	604	1,975	1,730	1,768	1,742
1935–36	1,294 S	1,134	1,152	1,036	1,802	1,760	1,686	1,540
1936–37	750	664	593	648	2,549	2,207	2,124	2,188
Average ..	928	796	773	774	2,032	1,842	1,878	1,777

S = Difference significant.

The following conclusions are drawn from the above results :—

1. Farm yard manure gives the best results when both cotton and jowar yields are considered together.

2. The sulphate of ammonia has given an increased yield of Kapas in 4 cases out of 5 while the jowar yield is similar to that of control.

3. The sann green manuring is not found sufficiently useful as the quantity of green matter was very small.

45. *Effect of groundnut and jowar rotation on cotton.*—This was the second year of the trial in single plots. The results are as under :—

Treatment.	Yield of kapas in lbs. per acre.	
	1936–37.	1935–36.
Cotton after groundnut	583	426
Cotton after jowar	261	255

The increase of yield in cotton crop is very high due to groundnut rotation.

46. *Dhaincha green manuring* versus *no manuring to rabi jowar.*—The Dhaincha seed was sown on 23rd June 1936 and the crop was buried on 10th August 1936. The quantity of green matter added was 6,959 lbs. per acre. The subsequent crop of rabi jowar yielded as under :—

——	Green manured.	No manure.
Yield of grain per acre	1,021	1,019
Yield of fodder per acre	2,424	2,718

The difference is not statistically significant.

47. *Trial of Spanish peanut.*—The yield of pods per acre has been as follows during the last four years :—

Year.	Yield.
1933–34	471
1934–35	732
1935–36	1,338
1936–37	1,050

48. *Cultural experiment on cotton.*—The object is to see the effects of growing cotton on ridges 4″ to 6″ high as compared to that on flat. As the rainfall was low, the advantage of growing cotton on ridges could not be observed. The yield of kapas was 577 lbs. per acre on flat as compared to 580 lbs. per acre on ridges.

(c) *Dohad Farm.*

49. The quantities of improved seeds supplied from the Farm are as under :—

Spanish peanut	2,186	lbs.
Maize	4,627	,,
Jirasal paddy	216	,,
Anklo paddy	308	,,
Wheat Pusa 4	12,151	,,
Yellow gram	2,833	,,

50. *Demonstration.*—In view of the precarious monsoon, Sundhia jowar seed was supplied free to cultivators for raising fodder from the grants placed at the disposal of the District Agricultural Overseer by the Commissioner, Northern Division. A demonstration was arranged on the Farm to show the cultivators the best method of sowing Sundhia fodder crop. They were further shown on the Farm the advantage of good cultivation which was evident from the stand of crops when these had already withered up in the District. The seed drill training class was held in June and over 70 bhil cultivators from round about places attended.

IV. PROPAGANDA.

Ahmedabad District.

51. *Trials in cultivators' fields.*—Cotton segregates 4–1 and open boll type 7–1 were tried but failed due to deficient rains. Banilla did well both as a dry and irrigated crop and is finding favour with the people. B. D. 8 had an area of about 300 acres but the yield was poor and no premium was given by the gin-owners for its quality.

Wheat.—No. 224 has done well in comparison with local Dhola Katha under dry conditions in Dholka Sub-Division ; while No. 808 gave promising results in Viramgam and Prantij as an irrigated crop. Pusa 52 has done very well as it is rust resistant and an early type.

Sugarcane.—Co. 213 and P. O. J. 2878 have maintained their places. During the season under report 6 types of canes, viz. 4 Coimbatoor types, E. K. and P. O. J., have been planted at two places in South Daskroi Taluka and their results will be watched with interest.

Groundnuts.—Magdi type failed everywhere in Viramgam due to bad season. In Prantij it yielded equal to Big Japan. Spanish peanut being a very early type has a future in the District. It gave an average yield of 680 lbs. per acre on an area of 55 acres in Prantij.

Jamnagar Giant Bajro.—It has still maintained its superiority in yield over local. However it is observed that the type is deteriorating in the length and thickness of ear-heads. Besides the fodder being thick is not liked by cattle.

Bajri No. 207 was tried in two plots, of which only one produced grains under irrigation. Further trials are therefore necessary.

Castor strain No. 20.—This is the second year of trial in Prantij where the strain maintained its superiority over local in yielding capacity. It seems to be earlier.

52. *Manurial.*—The trials of 10 lbs. Nitrogen in the form of Sulphate of ammonia were organised on groundnut and cotton in Prantij and Viramgam. The trial on groundnut failed due to dry season in Viramgam and the manure was not applied elsewhere due to insufficient soil moisture.

53. *Cultural.*—In Dholka sowing of cotton with 18″ v/s. 24″ drill was conducted and the latter gave better results. Trials with 15″ v/s. 18″ drill on wheat were carried out in Dholka and the latter has been proved to be of advantage. Dibbling of cotton 2′ × 2′ in Prantij and Dholka v/s. drilling 2′ apart was compared. The former gave better results at all places than the latter. Similarly two plots were arranged for dibbling groundnut in Prantij and the dibbled plots gave nearly double the yield than drilled plots.

54. *Fruit-trees.*—Cultivation of mosambi, orange, basarai banana is on the increase and similar is the case with guava, papaya, pomegranate and chikoo plantation. People now desire to go in for mango cultivation and all possible help is rendered by the Department to the growers.

55. *Demonstrations and shows.*—Five agricultural shows with magic lantern lectures were arranged along with Baby week organised by Village Uplift Committee. A cattle show and an agricultural exhibition was held at the time of Industrial and Art Exhibition in Ahmedabad. Nearly two lacs of people visited the show and 1,200 free passes were issued by the organisers of the exhibition. Prizes and medals were awarded by the promoters to the cultivators exhibiting best samples. It has given a great publicity of the Departmental activities.

56. *Rural Uplift.*—The Collector gave again a substantial grant to the Taluka Development Association, South Daskroi, for the supply of improved seeds, manures and implements at concession rate to the cultivators. A Kamgar at Ghogha has been maintained from the funds. Arrangement for constructing a pucca silo at Sanand has been made and half the cost will be borne by the Committee. A grant of Rs. 250 was also given towards feeding and prize distribution at the cattle show. All these activities are mainly due to the funds kindly made available by the Collector.

Panch Mahals District.

57. *Trials in cultivators' fields.—Cultural trials.*—Broad v/s. narrow sowing. There were four trials on maize sown 18" apart which gave an average of 8 per cent. more yield than the local method of sowing at narrow distances with a plough, in spite of a bad season.

58. *Manurial.*—It was not possible to conduct this trial in absence of sufficient rains.

59. *Varietal trials.*—Paddy strain K. 540 totally failed due to shortage of rains.

Groundnut.—Spanish peanut and small Japan groundnut were compared and it was observed that though the yields were nearly 50 per cent. of last year the former showed an increase of 16 per cent. over small Japan. It will be continued next year to see its behaviour in a normal season.

Jamnagari Bajro v/s. local.—Ten plots were laid out both in Eastern and Western Mahals. Jamnagari has been found to be much superior over local in yield but is inferior in fodder value. Further Jamnagari bajro was observed to have been less damaged by hairy caterpillars and will be better suited in Eastern Mahals where the pest makes its appearance every year. The trials will be repeated next season to confirm its superiority over maize crop.

Rabi jowar No. 8 was compared with local in four plots. As the late rains were favourable No. 8 showed its superiority over local by about 296 lbs. grain per acre. These will be continued with a view to confirm the results.

60. *Sugarcane.*—The area reached the maximum of about 2,200 acres mostly under Co. 213 but its future does not seem to be bright due to reduced rates of gul and bad seasons. The extension of P.o.j. 2878 will be restricted as the same was much damaged by white-ants though it yields better quality of gul. Trials with Co. 290 have been laid out as this variety is supposed to be better in gul quality and as hard as Co. 213.

One crushing plant was added during the season making a total of 8 in the District.

Multiple furnace is recommended to the owners of power crushers and double furnace is now in general use.

61. *Distribution of seeds, manures and implements.*—

Sundhia seed	.. .. ..	24,600 lbs.
Gram	.. .. ..	14,410 ,,
Groundnut	.. .. ..	5,280 ,,
Maize	.. .. ..	4,730 ,,
Wheat Pusa 4	.. .. ..	2,600 ,,
Sann seed	.. .. ..	4,800 ,,

Implements worth Rs. 2,270 oil-engines, crushers, harrows, hoes, etc.

62. *Rural Uplift.*—A Kamgar has been appointed at Jhalod for carrying out demonstration plots, working of implements and trial of new seeds. The Committee has sanctioned an extension for 1937-38 by providing additional amount of Rs. 667. Besides five stud bulls have been supplied to this area for cattle improvement.

63. *Demonstrations.*—In all 20 demonstrations were carried out on crops, implements and improved furnaces. Among the implements demonstrated in the Eastern Mahals, Karachi or Sindhi plough was found to be the most suitable for the tract as it has a crow-bar in place of a broad share. Three meetings were organised for demonstrating the advantages of improved farming.

Kaira District.

64. *Trials in cultivators' fields—Cultural.*—Wider sowing 15" to 18" apart against 12" local for cereals and groundnut crop was carried out by 45 cultivators in 10 villages on an area of 580 bighas against 340 bighas of last year.

Varietal.—Wheat Pusa 4 and 324, rice 184, bajri No. 207 and castor selection 20 were tried at several centres during the year but due to failure of monsoon the performance of those crops was very poor. Pusa 4 considered to be rust-resistant suffered badly due to rust along with other wheats.

Manurial.—As a result of past years' work the use of artificial manures has been widely advertised among the farmers and the trials have therefore been discontinued during the season. To make up for the deficiency of organic matter 60 maunds of sann seed were supplied to 8 cultivators in 6 villages for trial as a green manure for tobacco. Owing to severe attack of Katra pest the green manure crop failed and the effect could not be marked on tobacco.

65. *Distribution of seeds, fruit plants, manures, implements etc.*—

Sann seed	2,400	lbs.
Mosambi grafts	1,892	
Mango grafts	782	
Banana suckers	22,000	
Chikoo grafts	69	
Kagadi lemon plants	200	
Santra budded plants	220	
Fig plants	200	
Denatured salt	18,800	lbs.
Bone meal	7,360	,,
Dust guns	2	
Seeds of guava, pomegranate and papaya ..	4	lbs.

66. *Sulphur dusting against jiru mildew.*—The area under jiru crop was nearly half the normal due to dry monsoon and absence of sufficient cold at sowing time. The attack of mildew was not very severe in the season; however dusting was carried out in 44 villages by 175 cultivators on an area of 435 bighas.

67. *Sugarcane.*—The area under cane was about 800 acres, i.e., the same as last year. The chief type grown is mainly Co. 213 and a few acres of P.o.j. 2878. The yield and quality of gul was poor everywhere due to dry condition in monsoon.

68. *Horticultural propaganda.*—Improvement of country mango trees by "Khunti" grafting was undertaken and 116 trees were grafted at 11 places. As the season was very unfavourable almost all the grafts failed. The Sub-Overseer visited 40 fruit gardens and gave necessary help and advice for their proper working.

69. *Agricultural organisation.*—Two more Taluka Development Associations were started at Matar and Kapadvanj. Thus there are four Taluka Development Associations in the District now.

70. *Rural Uplift.*—During the year Rs. 575 were provided for the introduction of improved seeds and implements, stud-bulls, controlling mildew disease etc., and 53 demonstrations were held in villages on different items of Agricultural improvements.

Broach District.

71. *Cotton.*—B.D. 8 seed extension scheme has increased in volume in spite of many adverse circumstances. During the season B.D. 8 was not at its best due to unfavourable rainfall and wilt was reduced to the minimum in Goghari owing to low percentage of moisture condition. From the controlled area of 1,000 acres 715 kalsis or 457,600 lbs. seed and 615 full pressed bales of lint were obtained. The latter was sold at premium varying from Rs. 37 to Rs. 53 per candy. About 300 kalsis or 192,000 lbs. seed was distributed last year. This gave an area of about 20,000 acres including 418 acres under pedigree seed. In all 4,500 bales of B. D. 8 were put into market. Much of the cotton was mixed up by cultivators and sold as such as the gin-owners refused to buy pure B.D. 8 at a price equal to that of Ghoghari owing to low ginning. Bales of representative groups were sent to Bombay Mills for spinning tests and good results were obtained as before. The blow and card room loss was less than 13 per cent. in all cases. All mills spun for 20 to 24 counts (actual) with least strength 62·5 to 78 lbs.

72. *Trial in cultivators' fields—Jowar strain No.* 8.—No more village trials were taken in the District as it had been proved sufficiently to be superior to local in yield and quality. About 1,400 lbs. of pure seed was distributed. It has given 10 per cent. higher yield and has naturally spread to an extent of about 1,000 acres.

Wheat No. 224.—An area of about 500 acres was sown with this seed but unfortunately the whole area was damaged due to an unprecedented occurrence of rust in the district.

Groundnut.—The spread of this important crop has been poor as it has not yet been taken up readily by the cultivators. The low yield and costly harvesting operation are the two factors which come in the way. At Tralsa both the small and big types were tried. The Spanish peanut yielded 800 lbs. per acre against 600 lbs. of Big Japan. At other places the yield was very low due to insufficient rains.

73. *Demonstrations.*—Nine big demonstrations and several small ones were held in the district to bring home to cultivators the advantages of various agricultural improvements recommended by the department.

74. *Control of jowar smut.*—7,000 sulphur dust packets were distributed with the help of Revenue Department. It was found that several cultivators were still using copper sulphate which was easily available in local market.

75. *Cotton Boll-worm control.*—Seven counters and one Agricultural Sub-Overseer were appointed from the funds of the Indian Central Cotton Committee. Intensive propaganda was conducted specially in Jambusar Taluka where the work had not yet sufficiently progressed. The plant-puller with iron handle made of good steel has solved the difficulties of the people having sandy goradu soils. One thousand plant pullers were supplied inspite of the fact that the firm made undue delay in supplying the demands.

76. *Rural Uplift.*—A special class for training of district workers was held at Broach by the Collector. More than 100 educated persons attended the class. Demonstrations and lectures on improved methods of agriculture were given. They were also taken out for studying model agricultural practices on the Farm. The Collector placed a substantial amount at the disposal of the Agricutural Department for distribution of B. D. 8 seed in the district.

77. *Distribution of seeds, fruit plants, manures and implements.*—The following were distributed in the district during the year under report :—

Rabi jowar No. 8	1,400	lbs.
B. D. 8 Cotton seed	1,28,000	,,
Ground nut	1,000	,,
Wheat No. 224	20,000	,,
Sann seed	25,200	,,
Sulphate of ammonia	4,700	,,
Denatured salt	50,400	,,
Plantain suckers	1,100	No.
Grafts of mango and Chikoo	102	,,
Sulphur packets	7,000	,,
Plant-pullers	1,000	,,

Surat District.

78. *Cotton seed multiplication and distribution.*—As pointed out in the last year's report two Co-operative Cotton Sale Societies near Kim, viz., Mulad and Karanj and Ranveri in Chikhli were included in our seed area and controlled by the Department for making a larger seed stock available to meet heavy demands from the Native States. Thus the area increased considerably and was 25,582 acres including 1,589 acres grown with the Surat Farm pedigree seed. The total quantity of Kapas ginned was 7,798 Bhars giving 2,950 candies of lint.

Seed production :—		lbs.
Surat Farm produced	.. ..	18,800
Seed purchased from groups	.. ..	26,24,264
	Total ..	26,43,064

Out of the above stock 15,56,409 lbs. were supplied to Rajpipla State, Chhota Udepur and Idar States and the remaining quantity of 10,86,655 lbs. were distributed in the district by opening 24 depôts in the interior. Besides approximately 2,93,046 lbs. were directly supplied by Co-operative Cotton Sale Societies and gins at Bardoli to members and other buyers. Thus the total seed distribution of 1027 A. L. F. comes to 29,36,110 lbs. through the Department. There are still some gin-owners who encourage the spread of selection I-A seed in Bardoli and Jalalpore Talukas by ginning separately the produce of so-called Surat I-A crop and returning the seed to either merchants or cultivators who distribute the same for being grown in the next season. On account of the passing of the Cotton Control Act, Ghoghari has been practically eliminated but it is feared that its place will be taken up by the cultivation of Surat I-A seed which is available in large quantities with Co-operative Cotton Sale Societies, there being no restriction against this type in the Act. Thus the Department is faced with the difficulty of combating heavy odds and unless the Act is amended the controversy will remain to the detriment of trade.

79. *Jowar Budh Perio No.* 53.—In order to spread the improved variety of jowar rapidly in the district a scheme of supplying farm seed at half the concession rate to a selected cultivator in five villages of each of the four talukas, viz., Olpad, Chorashi, Bardoli and Jalalpore has been in operation since two years and will be continued for a total period of five years in order that the seed may naturally spread throughout the area during that period. Accordingly new five centres in each taluka will be taken up next season covering so far a total number of 15 villages in each taluka. The quantity of fresh seed supplied comes to 16,659 lbs. as against 15,108 lbs. of last year.

80. *Rice.*—The trial of K. 184 was continued at Amalsad and it was compared with the local Kada variety. Unfortunately the crop was spoiled by rains at harvest time and no accurate data are therefore available.

81. *Wheat.*—The trial of Pusa 4 was continued at Talavchora. Due to absence of sufficient sub-soil moisture the crop did not fare well and yielded 550 lbs. per acre. The variety being awnless was badly damaged by birds at maturity stage. It is believed to be rust-resistant but actually it is not so as has been observed elsewhere in this division.

82. *Sugarcane.—P.O.J. 2878 and E.K. 28.*—Regular trials of these two varieties has been taken from 1934-35 and the average results of three seasons may be stated as under :—

Variety.	Cane in tons.	Gul in lbs.
P.O.J. 2878	51·5	10,936
E.K. 28	41·6	10,114

These varieties are spreading round about Pardi, Bulsar, Chikhli and Amalsad.

Co. 213 is also spreading rapidly on account of its hardiness and occupies nearly 70 per cent. of the total area under cane. Three new varieties, viz., Co. 413, Co. 414 and Co. 421 have been grown on a small area at Malvada and their performance will be watched with interest. A comparative trial test is carried out at Mota-Vaghchhipa on Co. 213, Co. 290, Co. 413, Co. 419, P.O.J. 2878 and E.K. 28 and the results will be reported next season.

83. *Demonstrations and Shows.*—As a part of Village Uplift work an Agricultural Exhibition and Cattle Show was held at Bardoli and Jalalpore and a party demonstration was arranged on Surat Farm in the month of January 1937. Similarly the Department organised Agricultural Section in the Trade's Exhibition held at Surat from 13th March 1937 to 6th April 1937. Prizes and medals were presented to owners of best exhibits and good many people took advantage of this opportunity.

84. *Distribution of seed, fruit plants, manures, implements, etc.*—

Sugarcane	83,500	sets.
Suran	5,300	lbs.
Ginger	800	,,
Sann seed	1,200	,,
Mango and Chikoo grafts	500	No.
Pine apple suckers	100	,,
Power crushers	2	,,
Peerless dust guns	12	,,
Sulphur dust	27½	tons.

85. *Poultry Breeding.*—The poultry farm started by Sardar Khan Bahadur Bhiladwalla is running nicely and the eggs of white leghorn and Rhodes Island red are supplied to selected farmers in Pardi Taluka for breeding purposes.

86. *Stud-bulls.*—During the year under report 8 bulls have been supplied from the Rural Uplift grant and 6 bulls from His Excellency the Viceroy's Scheme. Besides two Gir bulls have been supplied in Pardi Taluka by one of the Kathiawar States. There is still a great demand from private bodies.

87. *Boll-worm control scheme.*—This is the fourth year of the propaganda and 17 counters were appointed early in February for carrying out a widespread campaign and to bring home to the cultivators the advantages of up-rooting cotton stalks immediately after the pickings are over. As desired by the Director of Agriculture the work was concentrated in the three talukas of Ankleshwar, Olpad and Chorashi where the work had been in good progress. Nevertheless other talukas were not neglected and the work was carried out in right earnest. Unfortunately the firm was not able to supply plant-pullers immediately on demand and besides the rates were increased due to rise in price of iron and steel. Thus the demand could not be complied with in full. However nearly 2,600 plant-pullers were supplied which with the previous number made up a total of 7,128 supplied by the Department in the district. The percentage of area up-rooted in the three talukas of Ankleshwar, Olpad and Chorashi where the work was concentrated came to about 47 per cent., 77 per cent. and 62 per cent., respectively while in the rest of the talukas it ranged from 13 to 35 per cent. and taking the whole area together the average works out at 46 per cent. up rooted in the area lying south of the river Narmada.

88. *Survey of Ghoghari.*—This was third season that a field to field survey was done with the help of 6 Kamgars specially appointed for the purpose from mid-December. In all 93 villages were surveyed covering an aggregate area of 30,218 acres cotton in parts of Bardoli, Jalalpore and Ankleshwar Talukas and our enquiry revealed the fact that last three years' continuous propaganda resulted in the gradual but total elimination of inferior Ghoghari as could be seen from the following information :—

Name of taluka.	Year.	Area under Ghoghari mixtures in acres.	Remarks.
Bardoli and Jalalpore ..	1933–34 ..	6,000	Estimated.
	1934–35 ..	1,813	Actually surveyed.
	1935–36 ..	660	Do.
	1936–37 ..	*Nil.*	Do.
Ankleshwar	1934–35 ..	51	Do.
	1935–36 ..	136	Do.
	1936–37 ..	*Nil.*	Do.

This has resulted in Navsari cotton selling at Rs. 10 (ten) "ON" Bardoli and Surat during current season unlike past years when it was sold on par or even at off prices (1933-34). The staff occasionally inspected ginning factories and carts of seed-cotton brought there for delivery which created a very salubrious effect on the minds of both merchants and growers alike.

V. ORGANISATION.

89. *Divisional Board.*—Under the Chairmanship of the Deputy Director of Agriculture three meetings of the Board were held. The members as usual took a very keen interest in the deliberations of subjects brought before them. Almost all the members in spite of their varied activities tried to attend all meetings of the Board and rendered valuable services by a hearty co-operation.

90. *Taluka Development Associations.*—Four more Taluka Development Associations have been organised in Kaira District thus making the total number of 10 Associations in the Division. Further efforts are being made to form two Associations in the Surat District, viz. at Bardoli and Chikhli. It is hoped that favourable crop conditions will prevail in the next season and the expectation will be materialised.

91. The new Gujarati monthly magazine "Khedut, Kheti and Sahakar" continued its publication with the joint efforts of Agricultural and Co-operative Departments. It is doing useful service in disseminating information on important agricultural matters to the educated farmers. The Department has arranged to purchase 500 copies of this mazagaine for free distribution to leading cultivators in the Division.

VI. AGRICULTURAL SERVICE.

92. *Supply of premium bulls.*—As a result of His Excellency the Viceroy's appeal for supply of good stud bulls the public have offered a fairly large sum towards meeting the cost of such breeding bulls. Besides the Rural Uplift Committees have also agreed to supply some bulls out of the India Government Grant placed at the disposal of the Collector in the Division. Accordingly 16 cow bulls and 6 buffalo bulls have been supplied in Surat and Kaira District, respectively, during the year under report and the demand is so great that we are not able to supply all of them at once.

93. *Mechanical help.*—During the year 36 applications for advice and help were received up to 1st April 1937 which were all attended by the Mechanical Assistant, Surat. Details of work done are as under :—

	Number.
(1) Erection of pumping plants	7
(2) Site survey	8
(3) Estimates and sketches	7
(4) Inspection, advice in repairing and enquiries, etc.	16

Besides he prepared good many charts for demonstrations and Rural Uplift Van and attended repairs of Departmental machinery.

VII. EDUCATIONAL WORK.

94. The staff inspects and examines Agricultural Bias Classes and conducts Vernacular Final Examination with Agricultural Bias in all the Districts of this Division. It is interesting to note that a refresher class for Agricultural Bias School teachers and a special class for Supervisors and Administrative Officers of all the District Local Boards was organised and conducted at Surat for a period of about twelve days and 31 persons attended. They were taken out on excursion to see fruits and vegetable gardens round about Surat and were actually shown the working of Bias Classes and Vocational Training School at Diwa and Ankleshwar respectively. The Superintendent, Surat Farm, successfully conduced the class with the help of local Officers.

VIII. PUBLICITY.

95. Good many members of the staff contributed articles to Khedut Kheti and Sahakar magazine published by the Joint Committee representing interests of the Agricultural and Co-operative Departments at Surat. Similarly advantage was taken of local Newspapers for giving wide publicity of Agricultural Exhibition organised by Rural Uplift Committee and promoters of Industrial and Art Exhibition.

V. A. TAMHANE,
Deputy Director of Agriculture,
Gujarat, Surat.

Surat, the 28th July 1937.

Programme of work to be done under the Deputy Director of Agriculture, Gujarat, Surat, for the year 1937-38.

I. RESEARCH.

SURAT.

(a) Cotton.

1. Evolving a type that will spin higher than 1027 A. L. F., while maintaining its fibre qualities and power of wilt resistance—

(*a*) by continuing selection from unit selections from local.

(*b*) by selection from the crosses and back crosses.

(*c*) by inter-specific crosses.

2. Dibbling at $1\frac{1}{2}''$ depth using 3 and 4 seeds to economise selfed seed.

3. Comparative yield tests of 1027 A. L. F., B. D. 8., I. A. cross 8-1, Jayawant cross 22-3-2 and selection 16.

4. Production of selfed seed of 1027 A. L. F. and B. D. 8.

(b) Jowar.

1. Maintenance of fixed types.

2. Production of selfed seed of Budh Perio No. 53.

BROACH.

Cotton.

1. Study of crosses to combine wilt resistance and good fibre quality of B. D. 8 with possible high ginning from other cottons.

2. Yield trials of B. D. 8 and N. S. 12 will be continued.

3. Multiplication of B. D. 8 for pure seed supply in the District will be continued.

4. Maintenance of fixed types.

JOWAR AND WHEAT.

Jowar.

1. Evolving a type superior to No. 8—

(*a*) by selection from the crosses 14×8, $222 \times A$,

(*b*) by making new crosses.

2. Production of pure seed of Rabi No. 8.

Wheat.

1. Selection of types from hard white and hard red wheats.

2. Taking preliminary yield trials of promising selections of 1935–36.

3. Taking replication yield trials of 224, 168 and local.

NADIAD.

(*a*) *Tobacco.*

1. Studies in raising seedlings.

2. Study of selections, White Burley×Adcock cross, Back crosses and promising strains N. 10–3 and N. 10–7–5.

3. Comparative yield trials of Harrison Special, G–6, N. 10–3.

4. Cigarette tobacco curing by the flue curing according to combined method and sun curing.

(*b*) *Bajri.*

1. Purification of 207, 206 and 251 and comparative yield trials of 207 and higher yielding selections.

(*c*) *Castor.*

1. Continued selection in S. 20 and S. 5 for high yielding.

2. Seed multiplication of above two types.

3. Testing of new selection S. 40.

VIRAMGAM.

(*a*) *Cotton.*

1. Study of selections made from 1933–34 to 1936–37 and thus sort out from the material grown at Nawanagar in 1936–37.

2. Further exploration of local Wagad for types having good quality of fibre and earliness.

3. Further selection and purification of crosses.

4. Observing the behaviour of Persian cottons for quality and earliness and using them as parents for crossing with Wagad 8.

5. Comparative trials of segregates 4–1 and 7–1 with Wagad 8.

(*b*) *Jowar.*

1. Study of selections made in 1933-34.

2. Yield trials of selected strains of Chhasatio and Utavali with local Chhasatio and Utavali.

SURAT FARM.

1. The experiments on manure, ridge cultivation, spacing rotation, green manuring in cotton and jowar, Dhaincha green manure fallow will be continued.

2. Seed multiplication of 1027 A.L.F., B.D. 8 cotton and Budh Perio No. 53 jowar will also continue.

DAIRY.

1. Maintenance of Dairy herd of best Kankrej milch cows and giving out stud-bulls.

2. To effect early maturity in the breed and improve the milk yield.

3. To observe the best lactation period in the breed.

BROACH FARM.

Jowar.

1. Production of pure seed of No. 8.

2. Evolving a type superior to No. 8 above by selection from crosses and making new crosses.

Wheat.

1. Selection of types from hard white and hard red wheats.

2. Taking preliminary yield trials of promising selections of 1935–36.

3. Taking replication yield trials of 224 and 168 with local.

Cotton.

1. Study of growing cotton after jowar and groundnut, Dhaincha green manuring on jowar, ridge and flat cultivation and green manuring on cotton will be continued.

DOHAD FARM.

1. Production of pure seeds of Spanish peanut, maize, gram and Pusa 4 wheats, etc., will be done for distribution to cultivators.

2. Manurial trials on wheat and groundnut will be taken up.

3. Holding party demonstrations for showing the use of drills and hoes.

II. PROPAGANDA.

Surat.

1. Control of seed multiplication of 1027 A.L.F., at various gin group centres and distribution of the resultant seed in the Surat protected area lying South of Narmada.

2. A field to field survey of Goghari in parts of Ankleshwar, Bardoli and Jalalpore Talukas.

3. Spread of Budh Perio jowar No. 53 through registered seed growers and distribution of pure seed from the Surat Farm.

4. Spread of clean-up measure for controlling cotton Boll-worm.

5. Watching for the strict enforcement of the Cotton Control Act.

6. Trial of sugarcane varieties and spread of CO. 213.

7. Propaganda of sulphur dusting on mango trees and advocating use of manures on fruit trees, rice and sugarcane.

Broach.

1. Advocating sann-green manuring in fallow lands and supply of sann seeds.

2. Propaganda against jowar smut and spread of clean-up measure in Jambusar Taluka for controlling Cotton Boll-worm.

3. Seed multiplication and extension of B.D. 8 cotton, 224 wheat and Rabi jowar No. 8.

4. Extension of groundnut as a good rotation crop.

5. Extension of the practice of threshing wheat by improved wheat thresher.

Kaira.

1. Seed distribution of Gandiu No. 6, wheat 224 and Pusa 4 and groundnut magdi variety.

2. Trials of wider sowing in cereals and groundnut.

3. Varietal trials of wheat, bajri and castors.

4. Sulphur dusting against jiru mildew.

5. Horticultural advice to cultivators regarding methods of cultivation and manuring of fruit trees.

PANCH MAHALS.

1. Trials on cultivators' fields for cultural, varietal and manurial treatments will be carried out.

2. Spread of P.O.J. 2878, improved furnaces, pans and crushers will be advocated.

3. Use of drills and hoes will be demonstrated in the Eastern Mahals.

4. Application of sulphate of ammonia for rice and sugarcane will be extended.

AHMEDABAD.

1. Trials of Wagad strains 4–1 and 7–1, bajri No. 207, castor S. 20, paddy K. 540 will be carried out.

2. Spread of wheats No. 224, Pusa 52 and 808 will be advocated.

3. Dibbling in cotton and groundnuts and wider sowing of cotton and wheat will be extended.

4. Extension of fruit cultivation and use of artificial manures on fruit trees.

5. Rural Up-lift work in Gogha Mahal for general agricultural improvement in the area.

V. A. TAMHANE,
Deputy Director of Agriculture,
Gujarat, Surat.

Surat, the 29th July 1937.

APPENDIX G.

Summary of work done under the Professor of Agriculture, Poona, for the year 1936-37.

Charge.—Mr. V. G. Gokhale held the post of the Professor of Agriculture, throughout the year except for a period of 2 months from 30th March 1937 during which time Mr. K. S. Kulkarny acted.

2. *Staff.*—Mr. H. G. Baluch who had gone out of India for higher studies returned to his post as the Manager, Agricultural College Dairy and Assistant Professor of Dairying and Animal Husbandry from 28th November 1936, thus relieving Mr. A. K. B. Cazi. Mr. C. N. Dave, who was on deputation returned on 31st March 1937 to his post of Demonstrator in Dairying thus relieving the acting incumbent Mr. J. J. Patel. There were no other changes in the staff.

3. *Lines of work.*—These remained the same as in the previous years.

A. Teaching.

4. The teaching which this section has to do for the degree course constitutes 31·4 per cent. of the whole.

The new course of studies for the B.Sc. (Agri.) degree reached its third year stage for the first time. The following shows the results of the University Examinations in the subject of Agriculture :—

Examination.	Number of students appeared.	Number of students passed.	Percentage of passes.	
			1935-36.	1936-37.
1. First year Science (Agri.) ..	....	....	75	75·8
2. Second year Science (Agri.)	....	....	97·6	95·5
3. B.Sc. (Agri.)	....	....	....	71·4*

*First Examination as per new syllabus.

It has been observed during the last three years that the total number of students in the first year science class came to about 75 in the first term and about 90 in the second term when the failed students rejoin. When such a number is divided into three batches, it becomes very difficult with the staff available to teach the students to the minimum required efficiency whether in crops, soils or implement practical classes. The number of bullocks available also is very insufficient for the batch. The students, therefore, are found to suffer very much. The same remark would apply to the new second year class which numbers 60. A batch of 20 for one teacher, is far too much and this cuts off the minimum individual attention that is necessary.

Special courses.—Two students took special short courses in Dairying. There is no regular class work as such. The students learn by actually doing all the work allotted to them and discuss their difficulties with the staff when time permits. The demand, even for this sort of training, is on the increase.

5. *College Farm.*—This is primarily maintained for practical agricultural instruction to all the College classes. It has also afforded land and other facilities to the different sections of the College for their field researches. A collection of old and modern agricultural appliances, a living museum of crops, grown in both the *kharif* as also *rabi* seasons, and a small workshop for the first year students' instruction in carpentry and smithy, continued to be maintained as usual.

(*a*) *The season.*—This was definitely very unsatisfactory. The total rainfall of the year was only 15·22 inches, inclusive of 9·45 inches in the rabi season, as against 23·25 inches during the last year and 27·13 inches which is the annual normal. Sowing of most kharif crops was somehow got done by the second week of July. Month after month tried the patience until irrigation was given.

The rabi rains were, however, more favourable though not as effective as they could have been with the usual previous reinforcement.

The winter was on the whole not very severe though from the 7th to the 10th January the lowest temperature ranged between 34° to 35°F causing rather serious damage to brinjals (70 per cent.), potato (40 per cent.), turmeric (20 per cent.) and a few other crops (5 to 15 per cent.).

As regards insect pests and plant diseases the following may be mentioned as prominent ones :—

Aphis on brinjals, mildew on *bhendi* and *jowar*, fruit rot of tomatoes, leaf curl on irrigated chillies. The aphis could be checked by tobacco dust extract but the others took a heavy toll.

The whole of the betelvine garden was completely killed by wilt (Sclerotium rolfsii) though a strenuous attempt was made to check its spread by spraying Kerol solution in the soil.

The following statement would indicate the effect of all these :—

Crop.	Yield per acre in lbs.		Best yield per acre in the history of the farm.	
	1936–37.	1935–36.	Year.	Yield in lbs.
1. Bajri—				
Irrigated	866	945	1934–35 ..	1,788
Not irrigated	605	..	....	..
2. Groundnut (Spanish peanut)—				
Irrigated	1,208	1,260	1912–13 ..	2,082
Not irrigated	707	1,640	1929–30 ..	2,214
3. Ground Big-Japan—				
Irrigated	1,477	..	....	..
Not irrigated	908	..	....	..
4. Cotton N. R.—				
Not irrigated	250	965	1919–20 ..	1,900
5. Cotton Broach—				
Not irrigated	518	864	1912–13 ..	1,380
6. Jowar (Shalu Maldandi)—				
Not irrigated	577	1,533	1928–29 ..	2,578
Irrigated	1,750	..	....	..

As regards irrigated crops most of them except sugarcane and sweet dotatoes suffered considerably mainly due to comparatively dry weather in spite of irrigation and partly due to frosty condition in January. The following figures give a general idea of this :—

Name of crop.	1936-37.	1935-36.
Sugarcane	13,000 lbs.	12,225 (Gul) lbs.
Sweet potatoes	14,970 ,,	13,274 lbs.
Suran	29,312 ,,	37,000 ,,
Tomatoes	7,500 ,,	14,000 ,,
Bhopala	4,776 ,,	21,256 ,,
Onion (bulbs)	24,030 ,,	29,379 ,,

B. Research and Investigation.

6. *Relation of Humus in the use of sulphate of ammonia as manure.*— The dose of N. was increased from 10 lbs. to 20 lbs. per acre to see if this would give any better results. This year's results show that the association of humus in the form. of farm yard manure with sulphate of ammonia has not added to the value of the latter alone.

7. *Position of leguminous crops as a rotation with a cereal.—Bajri* after *kulthi* has given significantly higher yields than *bajri* after *bajri* as it did three out of past six years. So also has *bajri* after *kulthi* stood superior to *bajri* after sesamum and *bajri* with a row mixture of *tur* in the order mentioned. Financially however, taking each rotation system over the average of all the years during which this study has been carried on, the results show that, so far as the gross value of the crops is concerned, they stand as follows :—

	Rs. a. p.	Rank.
Bajri—Tur mixture every (3 years) .. year.	74 7 9	I
Bajri and sesamum rotation (3 ,,) ..	40 5 9	II
Bajri and Bajri rotation .. (7 ,,) ..	32 1 3	III
Bajri and kulthi rotation .. (7 ,,) ..	28 9 3	IV

8. *Effect of different kinds of preparatory tillage with or without manure on dry crops in the Deccan.*—In the case of N.R. Cotton so far as tillage only is concerned harrowing the land and plowing the land showed no difference, either in association with manure or not as it happened twice before. As regards manuring (5 carts of farm yard manure per acre) the results show that this treatment is significantly superior to no manuring under both kinds of preparatory tillage, the effect of manure being more marked with harrowing.

The other dry crop was originally *Gidgap* grain *jowar*, but owing to shortage of rains it altogether failed and therefore was up-rooted. Linseed was grown in the *rabi* season. The yield of dried jowar plants that were up-rooted, showed that there was no difference between plowing and harrowing, either alone or when associated with manure. Manuring however gave significant increases over no manuring in both methods of preparation, the differences being more marked with harrowing.

With the linseed crop plowing showed superiority over harrowing whether manured or not, while manuring showed superiority over no manuring when the land was harrowed.

9. *Economics of dry-farming under Poona conditions.*—In this unit of 35 acres, the field work occupied the male members for 344 days and the woman member for 167 days thus bringing an average per head of 255·5 days at an average of 9·4 hours per day. The crop income during the year came to Rs. 940 out of which Rs. 142 were available for family labour of 2 persons, or Re. 0-3-1·4 per day per head, after meeting all payments outside. The total expenditure of the family of 3 persons (1 going out for work) came to Rs. 295-14-0 with a per meal charge of Re. 0-0-7·9. The two bullocks could get work only for 241 days while 66·5 units of bullock labour had to be hired on rush days.

10. *Manurial trials on vegetable crops.*—Consistently with the last 3 years' results N. has shown itself to be the ruling element for the crop of brinjals.

11. *Trial of Soya beans.*—20 varieties from the United States of America sent by the Economic Botanist to the Government, were tried. The seed of each of these was in very small quantities with the result that more seed has been now obtained from this year's crop for further trial next year on a larger scale. All these varieties, however, were observed to be less leafy, short, very early (80–90 days) and giving large sized seeds. 11 varieties already on hand and tried last year were further tested on a larger scale. These were found to yield from 40 lbs. to 876 lbs. per acre. Larger yielders (over 500 lbs.) are small seeded.

12. *Development of higher milk yield in cows and buffaloes along with early maturity and regular calving.*—The programme laid out in the year 1929 for improvement of Sindhi cows and Surti buffaloes by in-breeding, line-breeding and out-crossing was continued.

Sindhi Cows.—Under the out-crossing with bull Tulip the superiority of his daughter and other dams is established only to the extent of 22 per cent. With regard to the results of out-crossing with another bull Silver-Jubilee, no sufficient material was available during the year.

In the line-breeding policy six daughters of Pratab line were in milk, one-third of which showed superiority over their dams.

Surti buffaloes.—Out of two in-bred daughters of Bhagi with her son Dairy Butter, Bhagtur No. 114, calved for the third time and is now coming up even better than the mother, and Bhagtur II (No. 128) which has come in milk for the first time on 13th September 1936 is very much behind her dam.

With regard to line-breeding 16 buffaloes were in milk, and all cases have shown superiority over their dams.

13. *Maintenance of steady milk supply in a Dairy herd of buffaloes under Deccan conditions.*—These investigations commenced in the year 1930 were continued :—

(*a*) *Postponing service to subsequent heat by skipping earlier ones.*—The idea is to see if a desired number of conception in each month

can be got by this method. The summary of results obtained during the year is that—

(*i*) Animals whose heats in the months of January to April are missed, come again into heat in the following April to June and October to December but generally do not hold their services till December.

(*ii*) Usually from May to August no animals come in first heat due after calving.

(*iii*) Animals come in their first heat after calving in large numbers from September to January and if their first heat is missed or service not held due to any reason they come into their subsequent heat again regularly and get conceived within the following 2 to 3 months. The general conclusion that can therefore be drawn is, that this method cannot be helpful in getting the desired number of conceptions in all the months of the year.

(*b*) *Teasing as a measure for bringing buffaloes into heat when required.*—Teasing was not successful in bringing animals in heat at other than their usual time. It was further observed that the Dairy bulls did not care to tease buffaloes when kept with them.

C. Commercial working of the College Dairy.

14. The year began with 228 heads of cattle and ended with 267 as against 248 and 228 respectively last year. The increase at the end is mainly due to more births and less sales of stock during the year as a consequence of respectively more abortions in the preceding year and less milk yields also due to previous year's rinder-pest. There was no serious epidemic during the year.

15. The average yield of the cows and buffaloes stood at 3,134 and 3,455 lbs. respectively as against 3,380 lbs. and 3,556 lbs. respectively of the last year. The decrease in the yield is mainly due to the after effects of rider-pest of the previous year.

16. The cost of production of 100 lbs. of milk came to Rs. 15·3 as against 14·68 of the previous year, the increase being mainly due to the maintenance of a larger number of stock and the low fodder yield per acre on account of unfavourable season having increased the cost per unit. The realisation of milk per 100 lbs. works out at Rs. 11·89 as against Rs. 13·01 of the previous year. This reduction is due to the discount of 10 per cent. in the rates of milk sold to Sassoon Hospitals over those of previous year and to our having to sell milk to other customers at 8 to 9 lbs. per rupee as against 7 lbs. of the previous year owing to the general cheapening of milk in the market.

17. The total area under fodder crops was 231·17 acres as against 226·12 acres of the previous year. Out of this 89·1 acres were cropped more than once as against 69·5 acres of the last year. The increase in the total acreage was necessitated by the need of growing more fodder to meet the expected deficiency of fodder due to insufficient rains and irrigation.

The cost of production worked out at annas eight per 100 lbs. of green fodder as against 6·74 annas of the last year. The reason for this increase was the increased expenditure on irrigation and decreased yield per acre due to the unfavourable season described above. The dairy had, therefore, to purchase 117,171 lbs. of dry fodder worth about Rs. 1,500 as against 70,000 lbs. of the same worth Rs. 840 during the previous year.

18. The grazing of 38 acres furnished forage equivalent to full requirements of 11·97 adults for 120 days as against 19·5 adults for the same period. The decrease was due to scarcity of rainfall during the year.

D. Aid and Assistance to the Public.

19. *Help to other sections of the College.*—About 7½ acres of land was kept at the disposal of the other sections of the College as also the Agricultural Meteorologist for their researches. In addition, help in the form of labour and implements was also given to the several sections when possible.

20. *Visitors.*—An increasing number of visitors was evident during the year under report, both at the College farm and the Dairy. Among the prominent visitors ought to be mentioned Dr. N. C. Wright, Sir John and Lady Russel, Sir Chunilal V. Mehta, Mr. Kothawalla with Honourable Revenue member and a Veterinary Officer from Japan.

21. *Enquiries.*—Over 800 enquiries were received and dealt with on various topics such as implements, crop cultivation, manuring, seed, soil, implements, use of sewage, dairy produce and appliances, Dairy management, milk preservation, etc.

22. *Bull services.*—During the year the College Dairy supplied 46 bull services, 28 being to cows and 18 to she-buffaloes of the public.

23. *Shows and Demonstrations.*—During the year under report the Agricultural College Dairy put up three demonstrations in connection with sanitary milk production, handling, distribution, storage and consumption and manufacture of dairy products at the following places :—

(1) Bijapur, (2) Sholapur and (3) the Poona Industrial Exhibition.

24. *Publications.*—There was only one publication issued during the year as under :—

By Mr. C. N. Dave—

(1) Utilising separated milk for preparing cakes. Agricultural College Magazine, Vol. XXVIII, No. 2, September 1936.

V. G. GOKHALE,
Professor of Agriculture.

Summary of the article published by Mr. C. N. Dave.

1. The separate milk can be used with advantage for the manufacture of a product known as " Milk cake " which lasts in good condition for a long time and gives excellent taste. It has a special value during fast days being a pure and delicious milk product. It has a cooling effect and as such it is highly appreciated in the hot season.

2. Average yield of the product varies from 45 to 55 per cent. of separated milk.

V. G. GOKHALE,
Professor of Agriculture.

Programme of work under the Professor of Agriculture, Agricultura College, Poona, for the year 1937-38.

I. Teaching.

Teaching is the primary function of the staff of the Professor of Agriculture's section and this work will continue as in the last year. This will occupy about 60 per cent. of the time of the staff.

II. Administration.

In connection with the teaching, two large institutions, viz., the College Farm and the College Dairy, have to be run. The work under this section has increased steadily owing to greater and greater details in account and audit matters.

The heavy retrenchment of three graduate Assistants and three non-graduate assistants from 1st March 1932, has increased the burden on the remaining staff.

III. Investigation and Research.

Only about 10 per cent. of the time of the staff is thus available for this work. Therefore only such pieces of investigation and research can be tackled as would be possible in such a broken time. Subject to this limitation the following shows the programme under this head :—

A. Omission from the programme for the last year.

Subject.	Investigator Professor of Agriculture in collaboration with.	Reasons.
1. The study of Dry farming unit round Poona.	Mr. R. M. Chaudhari ..	Sufficient data collected.
2. Requirements of concentrated feeds for the Diary cattle in the Deccan.	Mr. G. V. Hardikar, Lecturer in Diarying and Mr. J. J. Patel, Demonstrator in Diarying.	For want of time.
3. Manurial trials on brinjal	Mr. A. R. Neginhal ..	Trials finished.

B. Continuation of last year's programme.

Subject.	Investigator Professor of Agriculture in collaboration with.	Reasons.
1. The most profitable scheme for vegetable growing.	Mr. A. R. Neginhal ..	Further testing.

	Subject.	Investigator Professor of Agriculture in collaboration with.	Reasons.
2.	The influence of different kinds of preparatory tillage.	Prof. K. S. Kulkarny ..	Further testing.
3.	Position of organic-matter in the application of artificial fertilisers.	Mr. K. R. Patel ..	Do.
4.	Position of Leguminous crop in rotation with cereals.	Mr. R. M. Chaudhari ..	Do.
5.	Trial of Soya beans ..	Mr. R. M. Chaudhari ..	Do.
6.	Development of higher milk yield in cows and buffaloes by breeding along with early maturity and regular calving.	Prof. H. G. Baluch and Messrs. G. V. Hardikar and C. N. Dave.	Do.
7.	Maintenance of steady milk supply among buffaloes under Deccan conditions.	Mr. C. N. Dave ..	Being yet incomplete.

C. Additions to the last year's programme.

	Subject.	Investigator Professor of Agriculture in collaboration with.	Reasons.
1.	To study the effects of mixing farm yard manure with green manure while plowing it under.	Mr. R. M. Chaudhari and Mr. A. R. Neginhal.	As desired by the Director of Agriculture, Bombay Presidency, Poona.

V. G. GOKHALE,
Professor of Agriculture.

APPENDIX H.

Summary of work done under the Agricultural Chemist to Government, Bombay, Poona, during the year 1936-37.

Rao Bahadur D. L. Sahasrabuddhe was in charge of the office and laboratories of the Agricultural Chemist from the beginning of the year up to the date of his retirement on 1st September 1936. From 1st September Mr. V. G. Gokhale looked after the work in addition to his own duties as Principal, Poona Agricultural College, till Dr. J. A. Daji, the permanent incumbent took over the charge from him on 23rd December 1936.

The work done under the Agricultural Chemist falls under the following headings :—

1. Teaching.
2. Analytical and advisory, and
3. Research.

Teaching.—The teaching of Chemistry at the Poona Agricultural College is one of the duties of the Agricultural Chemist who is also the Professor of Chemistry. In this he is helped by one Assistant Professor and one Lecturer in Chemistry. During the absence of the permanent incumbent from 1st September to the end of December 1936 the teaching work was carried on mainly by Mr. N. Narayana, the Assistant Professor of Chemistry, with the help of the lecturer Mr. V. S. Abhyankar.

The teaching work involves a good deal of manual labour in arranging the laboratory for the students practical class. At present all this work is being done by the Assistant Professor and lecturer, which leave them no time for undertaking any kind of research. The need for demonstrator is very keenly felt. But it will greatly facilitate matters if at least a non-graduate assistant is given to help the teaching staff. The number of students in the First and Second years has been increasing of late. Students have to be huddled and more accommodation is becoming more and more essential.

There were four post-graduate students working during the period under report. One of them completed his research and submitted his thesis to the Bombay University and obtained the degree of M.Sc. Another discontinued during the year, thus leaving only two post-graduate students at the end of the year. One of them is working for the M.Sc. and the other for the Ph.D. degree.

Analytical and Advisory.—A large number of samples were received during the year for analysis and opinion both from Government as well as from private firms and individuals. Among Government samples the various departmental farms contributed the largest quota. The

following table gives the nature and number of samples received for analysis during the year under report :—

Nature	Government samples.	Private samples.
Soils	381	*Nil.*
Waters	21	11
Manures and fertilisers	41	8
Dairy products	9	1
Foods and feeding stuffs	27	1
Oil seeds	40	2
Fruits	*Nil.*	2
Miscellaneous	82	4
Total	601	29

Most of the soil samples received from the departmental farms were in connection with the experiments carried on at those farms. Two hundred soil samples were received from the Superintendent, Agricultural Station, Surat. These samples were from plots on which the action of sulphate of ammonia is being tried for a number of years. The object with which the samples were analysed was to see if the continuous use of sulphate of ammonia caused any change in soil reaction and in the lime-status of the soil. The Superintendent, Agricultural Station, Dharwar, sent forty samples of soil in connection with a bunding experiment carried on at that station for a number of years. The samples were analysed for the total plant food constituents. Another lot of twenty-four soil samples was received from the same station in connection with a manurial experiment that is now coming to an end. The Professor of Agriculture sent forty-eight samples pertaining to a rotation experiment carried on by him for the last few years for nitrogen determination. Twenty-seven samples of soil were analysed for the Plant Pathologist to Government, Bombay, Poona, in connection with a research work carried on by him on nitrogen-fixation in rice soils at Karjat.

Most of the waters received from the Gujerat division, were found on analysis to be unfit for irrigation as they contained large amounts of soluble salts. Some waters from that division showed the presence of sulphuretted hydrogen.

Among the manures analysed two samples deserve notice. One was a sample of sulphate of ammonia of Japanese manufacture. On analysis it showed a purity percentage of ninety-seven which compares very favourably with that of European manufacture. The other was a sample of poudrette which was found to contain an extremely low amount of nitrogen.

Several samples of butter and ghee were analysed for the Assistant Marketing Officer, Poona. A sample of toddy was found to contain chloral hydrate. The residue left after extracting lemon juice from lemon fruits sent by the Assistant Marketing Officer, Poona, was found to possess good nutritive value to be used as a cattle food. Twenty

samples of tobacco were analysed for the Tobacco Breeder, Nadiad, in connection with his experiments on different methods of curing tobacco leaves. Sixty-four culture solutions were analysed for the Plant Pathologist for his experiments on the fixation of nitrogen by rice plants.

Research.—Studies on the proteins of Bajri were completed. Studies on the ripening of fruits, viz., bananas and mangoes were continued. The rate of respiration and the accumulation of important constituents like starch, sugars etc. were determined at various stages of ripening.

For the study of the intake and flow-back of nutrients of crops suitable methods of analysis were worked out, especially for minor elements like copper, manganese etc.

Publications.—The following papers were published during the year :—

(1) Mineral Constituents of Food Grains, Vegetables and Cattle Feeds of Western India ; by Rao Bahadur D. L. Sahasrabuddhe and S. L. Lele. Bulletin No. 179 of the Bombay Department of Agriculture.

(2) Nitrogen fixation by rice soils and rice plants ; by Rao Bahadur D. L. Sahasrabuddhe. Trans. Third International Cong. [Soil Science, Vol. 3, pages 111–113.

(3) Fluctuations, recuperation and fixation of nitrogen in the soils of Western India ; by Rao Bahadur D. L. Sahasrabuddhe. Proc. National Inst. Sci. India, Vol. 3, pages 139–147.

General.—Help was given whenever solicited for demonstrations at Agricultural shows from time to time. Vinegar-making, distillation of essential oils, and the preparation of bone powder by charring bones were very popular items at the various shows and exhibitions.

Staff.—Mr. N. Narayana on returning from leave on 1st June 1936 took charge of the duties of Assistant Professor, reverting Dr. V. N. Gokhale. Mr. S. L. Lele, lecturer in Chemistry, was transferred to Kumta on 16th June 1936. Mr. V. S. Abhyankar took his place and is continuing in that post.

Mr. D. M. Ranade, senior assistant, was on leave on medical certificate for one month and twenty days from 20th April to 8th June 1936. Mr. K. V. Shinde, office clerk, was on leave on average pay for a period of two months from 10th May to 9th July 1936. Dr. V. N. Gokhale, one of the Junior Assistants, was on leave on average pay from 3rd January to 2nd March 1937. On the expiry of his leave he was appointed Assistant Investigator, Dry Farming Research Scheme, Sholapur, from 3rd March 1937. Mr. M. M. Kibe was appointed in his place from 1st April 1937.

Programme of work for 1937-38.

I. *Studies to be continued from previous year—*

(1) Changes taking place during the ripening of fruits.

(2) The intake and flow-back of mineral nutrients of a few typical crops.

II. *New items for study—*

(1) A beginning will be made to study the physico-chemical properties of some important soil types of the Presidency.

(2) An attempt will be made to investigate the photo-chemical theory of Dr. Dhar as regards nitrogen fixation in soils.

(3) The use of molasses as an aid to soil fertility will be tried.

J. A. DAJI,
Agricultural Chemist to Government,
Bombay, Poona.

ABSTRACTS.

"Mineral Constituents of Food Grains, Vegetables and Cattle Feeds of Western India", by Rao Bahadur D. L. Sahasrabuddhe and S. L. Lele. Bulletin No. 179 of 1936.

This bulletin gives the mineral constituents chiefly, iron, lime, phosphoric acid and chlorides of some of the important food-stuffs used for both human as well as cattle consumption.

"Nitrogen Fixation by rice soils and rice plants", by Rao Bahadur D. L. Sahasrabuddhe. Trans. Third Intern. Cong. Soil Science, Vol. 3, pages 111–113.

From experiments conducted in the laboratory it was found that the rice soil carried an innoculum which was responsible for fixing large quantities of nitrogen in the presence of the growing roots of rice plants. It is not sure if the innoculum is carried within the rice seed but it is probable that it is carried on the surface of the seed.

"Fluctuations, Recuperation and Fixation of Nitrogen in the soils of Western India", by Rao Bahadur D. L. Sahasrabuddhe. Proc. National Insti. Sci. India, Vol. 3, pages 139–147.

This paper gives a short account of the work done on soil nitrogen for the last fifteen years, the results of which were published from time to time. It shows that there is a definite recuperation of nitrogen in the Deccan soils under both laboratory and field conditions. The nitrogen level varies with the season under dry as well as irrigated conditions.

APPENDIX I.

Summary of Work done under the Economic Botanist to the Government of Bombay, Poona, for the year 1936-37.

During the year under report Professor L. S. S. Kumar held charge of the post of the Economic Botanist to the Government of Bombay, Poona, up to 14th June 1937. From 15th June to 4th August 1937, he has been deputed on behalf of the Imperial Council of Agricultural Research, New Delhi, as a representative from India to attend the Fourth International Grassland Congress to be held in July, in Great Britain; further he is to be on leave from 5th August to 18th September 1937 to undergo training in the latest methods in Cytological technique and Genetic investigations.

During the absence of Professor Kumar, Mr. V. M. Chavan, Assistant Professor of Botany, continues to officiate as Economic Botanist and Mr. S. R. Godbole, as Assistant Professor of Botany, in place of Mr. Chavan. In connection with the U. T. C., Mr. Chavan was attached to a Military Unit for training for a period of two months during April and May 1937.

Mr. S. R. Godbole, the Assistant Economic Botanist, was on leave from 5th April to 14th June 1937, and Mr. R. D. Gaitonde officiated in his place during that period.

Mr. W. V. Joshi, Demonstrator in Botany, was on leave from 4th August to 3rd December 1936, when Mr. N. M. Patel, Linseed Breeder, acted in his place.

Mr. N. M. Patel continued to hold the post of the Linseed Breeder throughout the year, except for four months when Mr. Gaitonde officiated as Linseed Breeder.

Grass Research.

1. *Rotational Grazing.*—The Rotational grazing at the Mangdara Kuran, near Divaghat, for the year commenced on the 16th October 1936, two months later than the usual practice owing to the extremely unfavourable condition of rains during the months of July, August and September. The animals were only 103 to begin with; the number utlimately increased to 175, the maximum for the current year. The reduction in number was due to cultivators in the neighbourhood having sent away their animals to distant parts where some grazing was available in the earlier period of the season. The herd was shifted from block to block but the shifts were rather quick as the grasses were sparse. The conditions did not improve much and consequently the grazing had to be discontinued for the year, by the end of January 1937, one month earlier than the usual practice.

2. *Effect of grazing on the live-weight of animals.*—As in the previous year, a herd of ten adult animals was selected and weighed three times during the experiment, viz., at the commencement, middle and at the end. The result shows that there was an average increase in live-weight of 38 lbs. or 8·6 per cent. by the end of December 1936 and an average loss of 18·5 lbs. or 3·9 per cent. by the end of January 1937. The direct relation between the freshness of the vegetation with the increase in the live-weight of the animals was again corroborated this year.

3. *Yield of grass.*—The yield of grasses, from 20 old and 20 new representative random quadrats 10′ × 10′ each, cut from the block, each time the shift was made, showed slight decrease in yield owing to the unfavourable season.

4. *Study of Andropogon Contortus.*—Areas of *Andropogon contortus* have again been mapped out in each block this year and there is clear indication that spear grass is being eliminated by better perennial grasses in a gradual process.

5. *Land Development and Shrub clearing.*—No more bunds were erected this year ; but the walls of old bunds had to be increased in height as they were completely filled up with silt ; some bunds had to be repaired. The succession of grass vegetation on the silted areas was conspicuous. No shrub clearing was undertaken as it had been already estimated during last two years as to how much average quality of edible grass was wasted under such shrub, if the lower branches of the shrubs were not cleared off by lopping.

6. *Survey of Forest grass kuran at Satpur near Nasik.*—The Deputy Director of Agriculture, N. C. D. Nasik, proposes to start a Rotational grazing experiment, in collaboration with the Forest Department, in Satpur Kuran near Nasik. In connection with this a complete survey of the grass vegetation from the Kuran was made and maps were prepared.

Grazing experiments at the Gilligan Cattle Breeding Farm, Pimple, near Jalgaon, under the Deputy Director of Agriculture, N. C. D., Nasik, could not be started owing to the failure of rains in those parts.

The five years' Grass Research Scheme which was financed by the Sir Sassoon David Trust Fund under the Economic Botanist has been further extended for one year more during 1937-38.

Striga Research.

The work of selecting Striga resistant plants from fifteen different varieties of jowars of this Presidency was continued during the year under report. It is observed that of the three single plant selections viz., " Bilichigan P3 ", " Surat P1 " and " Maldandi P7 " selected in December 1933, December 1933, and November 1934 respectively, only progenies of Bilichigan P3 are nearing purity for resistance, while selection from the remaining two are still throwing off very high

percentage of susceptible plants even after three generations of continuous selfing. From Bilichigan P3-15-6 of last year nine resistant plants have been obtained during the current year and of these sufficient seed of five plants has been harvested; the remaining four had produced very poor earheads.

Of the twelve new varieties taken up for selection of Striga-resistant plants in 1935, only one, viz., Muddinandyal, has given high percentage of resistant plants even in the very first year of its selection. The remaining eleven varieties have failed to give a single Striga-resistant plant even after two years of trial. It appears that "Muddinandyal" seems to carry more of resistance character as compared with "Bilichigan" which during its first year of trial never gave such large number of resistant plants. Since test has been made only in the laboratory it is proposed to carry out this test under field conditions during the coming season to obtain seeds for further work.

The adverse weather condition which prevailed throughout the growing season has given a set-back to these experiments in that a number of resistant cultures were either destroyed or the plants having become stunted, produced no seed.

On testing the fresh seed of the three *Striga* species with and without host seed, it was found that (*a*) *Striga lutea* seed germinated only in the presence of host, (*b*) *Striga euphrasioides* seed germinated with and without host and the germination percentage was higher in the latter case, and (*c*) *Striga densiflora* did not germinate at all. This behaviour requires further investigation.

Orobanche Research.

The work of selecting Orobanche-resistant tobacco was commenced in 1933. Fourteen different varieties were under trial and of these only Adcock, White Burley and Gandieu have given resistant plants. The progenies of these plants are now in the third generation and are still highly splitting for susceptibility. The percentage of susceptibles obtained during the current year's trial has been as high as 98 per cent. indicating that it will be a slow process to obtain a type which will be completely resistant. In order to obtain quicker results, it would be necessary to grow several thousand plants but this is not practicable with the present staff and funds available. The work is continued on the same plan as that in *Striga* research.

Linseed Breeding Scheme.

This was the third year of Linseed Breeding Scheme financed by the Sir Sassoon David Trust Fund. During the year under report further selection work in the improvement of presidency linseed was carried out at Poona. The crop at Indi in Bijapur District, proved a complete failure on account of famine due to scarcity of rain and hence the station was closed early in December 1936 for the year.

1. *Selection work at Poona.*—From 295 single plant cultures grown in the previous year, 194 individual plant selections were made and grown in plant-to-row cultures during the year under report. Out of these 194 line cultures 48 combined all the three characters, viz., better yield, higher oil content and superior drying quality of oil in them. 122 combined better yield and higher oil content, 23 combined better yield and superior drying quality and one better yield alone. Further single plant selections have been made from these line cultures primarily on the basis of yield and are being tested in the laboratory for oil content and drying quality of oil. Final selections will be made hereafter.

A few selections based on morphological differences of the plants have also been made and will be tried further.

Majority of the single plant selections have kept up their yield and oil percentage with a fairly high degree of uniformity and purity in the field, but there is a considerable fall in the iodine absorption numbers. All the presidency types of linseed being brown-seeded, the character of drying quality of oil, requires to be introduced from white or yellow seeded, non-presidency, pure types, by hybridization.

2. *Varietal trials.*—Mass seed samples of each of 119 line cultures which yielded high in the previous year were tried on a fairly large scale to investigate their yielding capacity *inter se.* The results indicate that early maturing types from Khandesh and Deccan yield well under Poona conditions.

3. *Yield trials.*—21 varieties including 10 non-presidency pure types were tried in a 3×3 Graeco-Latin Square. The United Provinces and Pusa types which were significantly low yielders in previous trials were eliminated and six Peninsular types from Pusa were substituted to be tried along with the Presidency material. The results show that outside varieties from Central Provinces and Pusa Peninsular types, except Pusa L. T. I., compare favourably with presidency material in yielding capacity. The results are in agreement with those of previous years.

4. *Non-Presidency pure types.*—There are 22 non-presidency pure types of which those from Central Provinces and some of the Pusa types are valuable from the point of view of economic characters for hybridization. 27 types received from North Ireland, Africa, Canada, U. S. A. and U. S.S.R. on analysis show that in point of oil content they are very poor being below 40 per cent. but the quality of oil is fairly good. These extra-Indian types, however, for the first year of their introduction, did not thrive well under field conditions for growth and gave a very poor uneven stand and low yield. A few of them have totally failed. With one or two exceptions all these types are seed flaxes.

The plot at Indi in Bijapur District will be again taken on lease during the coming season. The Linseed Breeding work will have to be continued further with a view to undertaking hybridization work in the valuable material in hand.

Plant Introduction and Plant Improvement.

1. *Acclimatization of Australian grasses.*—The six species which had flourished well during last season, were tried on large scale, but did not succeed well as the weather conditions were quite adverse.

2. *Weed Killing.*—During last season it was observed after trials with doses of different strengths that all non-grass weeds could be destroyed by application of 1·5 per cent. solution of Sodium Chlorate. This year it was proposed to take up the work on field scale, but owing to the exceptionally unfavourable season it could not be undertaken.

3. *Classification of Tur and Groundnut.*—The work of recording morphological characters was continued. The work of classification will be taken up shortly with the data collected so far.

4. *Esparto grass* (*Stipa tenacissima*).—This hardy perennial grass thrives in ordinary soils in tropical regions of South Spain and North Africa and is propagated by seeds or by divisions. It is very useful for paper-making. A few clumps specially brought from Algiers in Africa were tried in the Economic Botanist's area, but as the clumps had dried during the long period of transit, most of them failed to revive. A few clumps divisions put forth meagre sprouts most of which gradually withered in spite of great care. It will be attempted to secure fresh clumps and seeds of this grass for trials during the coming season.

Vernalization.

During the year under report the experiments on vernalization (pre-treatment) of seeds to induce early maturity and increase in yield, were repeated for the third year. The work was continued on the following lines :—

(1) Since the results of vernalized crops of the previous years were of a doubtful value, some of the previous year's treatments were repeated on a fairly large scale with a view to verify the previous results and to ascertain their significance.

(2) In some cases new treatments were devised.

(3) Attempts were also made in some cases to see if the treatments of the previous year would show any residual effects on the succeeding crops.

(4) By repeating the same treatments on the progeny of the previous year's treatment, attempts were also made to study cumulative effects in some cases.

Summary of results for each crop is as follows :—

(1) *Bilichigan Jowar.*—Treatment No. 7 (under air-dry sand for a fortnight) that had shown good results in the previous year was tried on a replicated scale. The results are distinctly unfavourable for the treatment. Cumulative and residual effects were nil.

(2) *Bajri strain No.* 59.—Only one treatment (No. 2 under room temperature in darkness for ten days) that had shown fair results in the previous years was repeated on a replicated scale. The treatment proved superior to the control but the differences were slight and were not significant. New methods devised for the first time in the year failed to show results in the desired direction.

(3) *Bansi wheat strain* 103.—Three of the previous years' treatments were repeated and the seed was sown at Poona and at Niphad. The results of the latter were vitiated due to poor germination. In the Poona trial Treatment No. 4 (vernalizing at 55° F for 10 days) was found early and high yielding as compared with the control and the other treatments failed.

(4) *Local groundnut.*—Two of the treatments (Nos. 9 and 11—treatment 9 under 55° F for 16 days and treatment 11 slow soaking vernalized under room temperature for 16 days) that showed fairly good results in the previous year were re-tried on replicated scales. Both the treatments proved inferior to controls. Treatment No. 9 alone was studied for cumulative and residual effects but such effects were not visible in either case.

(5) *Cotton.*—The work of the last three years on vernalizing 1027 A.L.F. cotton has not shown any tendency to bring about earliness or substantial increase in yield.

African Bajri trials.

This Bajri variety has been under study for the last two years. It was found to be inferior to and later than the local Bajri strain 54, in the previous year. During the current year the trials were made on two occasions on a replicated scale. One was sown early (29th June 1936) so as to give the late African Bajri a chance to develop fully and another was sown at the normal time (24th July 1936). Since the African variety was found to show a tendency to lodge, bamboo supports were tied to the plants in the case of the early sown crop.

The African Bajri was distinctly late by about eighteen days. In point of yield the results are very indifferent. In one trial the local Bajri gave significantly higher yield, in another the results were reversed and in the remaining two the differences were slight and not statistically significant. The African bajri, therefore, is of extremely doubtful utility.

Experiments on X-raying.

Mustard seeds were again irradiated as in the previous year, at the Sassoon Hospital, Poona, with the help of the Radiologist; but the experiment was entirely vitiated due to a severe attack of wilt on the crop grown from the treated as well as the untreated seeds. The experiment will be discontinued.

East African Jowars.

Some of the good fodder types were grown again with a view to preserve the material in a pure form, mainly in connection with teaching work.

Teaching work.

The Economic Botanist was assisted by the Assistant Professor of Botany and Demonstrator in Botany in teaching work.

The first year class was taught General Elementary Botany and the second year class was taught compulsory Agricultural Botany, comprising Cytology, Genetics, and Advanced Plant Physiology and Histology, as prescribed in the new course. The results of the University examinations held in March 1937, show that the percentage of successful students in Botany in the F.Y.Sc. and Sy. Sc. (Agri.) examinations was 73 and 83 respectively.

The Botanical laboratory is gradually being equipped according to the requirements of the new course as well as to train students for post-graduate work in advanced botany.

Seed Testing.

Eighty-seven seed samples were tested and reported on during the year. Cotton seed samples received from the Agricultural Engineer, Bombay Presidency, Poona, were tested on experimental basis, involving a large number of cultures. Besides seeds of nine local grasses and twenty local vegetable varieties are being tested at regular short intervals for determining their longevity.

Herbarium.

The Herbarium of the Economic Botanist's section which contains very valuable old plant collections, now requires replenishment and addition of angiosperms of the Bombay Presidency, therefore some grant every year is quite necessary for the adequate replenishment and equipment of the herbarium. The collection of some species which are easily available is being done. The preparation of a catalogue including the complete collection of the herbarium specimens, in a bulletin form, is gradually being done.

Miscellaneous.

Identification of plants specimens, supply of seed of economic plants, and replying to enquiries of economic importance, are matters of importance, that the Economic Botanist has to attend to, throughout the year. This year 216 plant specimens were identified as against 327 of the previous year. Seeds were supplied to Russia, China, England, Africa, Egypt and America, in addition to the various research workers from different parts of India, and 90 economic enquiries, as against 75 of last year, were dealt with during the year under report. In addition to the Research, administrative and teaching work, Professor Kumar is in charge of the Agricultural College Gymkhana, as Chairman and Lt. V. M. Chavan holds charge, as platoon Commander of the Agricultural College platoon No. 6 of the " B " Coy, Poona, in the 1st (Bom.) Bn., U.T.C. (I. T. F.).

New research schemes proposed by the Economic Botanist.

(*a*) A scheme spread over a period of five years for investigation into Striga attack on Jowar, approved by the Imperial Council of Agricultural Research, New Delhi, has been sanctioned and is likely to be started from October 1937, when the funds will be made available.

(*b*) A scheme spread over a period of three years for research on Cytology of Papaya, has also been sanctioned by the Imperial Council of Agricultural Research, New Delhi, and will be started as soon as funds are available.

(*c*) A scheme for research on improvement of grasslands by Rotational system of grazing and the Ecological study of Forest Grasses, proposed jointly, to Government of Bombay, by the Economic Botanist and the Divisional Forest Officer, Working Plans, Central Circle, Poona, has been recently passed by the Provincial Research Council, and will be forwarded to the Imperial Council of Agricultural Research, New Delhi, for approval.

Economic Botanist's Area.—The land which was originally poor is gradually being improved by careful development and cultivation. The area is used for growing material for research and teaching work. An additional area of about three acres was obtained last year from the Professor of Agriculture on the College estate for conducting field experiments and Linseed Breeding work, as the present Economic Botanist's area is not sufficient for experimental purposes.

Publication.

1. Kumar, L. S. S. .. "Sterility in Cotton" published in the Journal of the University of Bombay, Volume V, Part V, March 1937.
2. Chavan, V. M. .. "Ophiocephalous straitus" (Murral) (an important fish in the Deccan tanks and rivers) to be shortly sent to the Natural History Society Journal, Bombay, for publication.
3. Godbole, S. R. .. "Sisal Ghaypat" published in Shetki and Shetkari Magazine, No. 7, January 1937.
4. Joshi, W. V. .. (1) "Xerophytes" published in Shetaki and Shetkari Magazine, June 1937.
   (2) "Hydrophytes" published in Shetki and Shetkari Magazine, July 1937.

V. M. CHAVAN,
Ag. Economic Botanist to
Government of Bombay.

AGRICULTURAL COLLEGE:
Poona, 30th July 1937.

Programme of work under the Economic Botanist to the Government of Bombay, Poona, for the year 1937-38.

1. *Grass Experiments.*—(*a*) Rotational grazing experiment at Mangdara Kuran, Divaghat to continue. (*b*) Rotational grazing experiments at the following places will be undertaken in collaboration with the Deputy Director of Agriculture, N. C. D., Nasik, if necessary facilities are available :—

(1) Gilligan Cattle Breeding Farm, Pimple, Jalgaon Taluka.

(2) Forest Kuran at Satpur, near Nasik.

(3) Forest Kuran at Pimple in Sinnar Taluka.

(4) Nasik Panjarpole Kuran at Chinchola.

(*c*) Weed Killing on field scale will be tried. (*d*) Australian grasses will be tried on a large scale.

2. *Striga on Jowar.*—(*a*) Further selection work of Striga-resistant jowars to continue. (*b*) Histological studies of haustorial connection to be taken up. (*c*) Cross inocculation experiments on South African resistant Sorghums and Indian Striga to be started.

3. *Orobanche on Tobacco.*—(*a*) Selection of Orobanche-resistant tobacco types to continue. (*b*) Histological studies of haustorial connection to be taken up.

4. *Linseed Breeding.*—(*a*) Further selection, purification and study of the promising selected material to continue. (*b*) To take up replicated yield trials of high yielding types along with non-presidency pure types. (*c*) To maintain non-presidency pure types for the study of their useful characters with a view to use them for hybridization. (*d*) To acclimatize the foreign types. (*e*) Study of plant character, blooming, anthesis etc., in local selections and in the pure types.

5. *Vernalization.*—Further trials on wheat will be undertaken.

6. *African Bajri.*—Replicated trials will be continued on a large scale, and with different spacings.

7. *Seed testing.*—Longevity tests on grass and vegetables seeds to continue.

V. M. CHAVAN,
Ag. Economic Botanist to
Government of Bombay.

AGRICULTURAL COLLEGE :
Poona, 30th July 1937.

APPENDIX J.

Summary of work done under the Crop Botanist to Government of Bombay, Karjat (Kolaba), for the year 1936-37.

Administration.

During the year under report Mr. B. S. Kadam held charge of the post of the Crop Botanist to Government of Bombay.

Mr. V. K. Patankar continued Superintendent, Rice Breeding Station, Karjat.

Messrs. R. K. Kulkarni and S. M. Patel continued to hold the posts of the Superintendent and Bajari Breeder respectively at the Cereal Breeding Station, Kundewadi, Niphad.

The Cereal Breeding Station at Kundewadi, Niphad, has now become a full-fledged station with residential quarters for the superior staff, office, laboratory and store buildings and a bullock-byre. The area of the station has increased from 6 to 19 acres and at present the station deals with the three major crops, wheat, bajari and gram and with such minor crops as Tur, Rala and Linseed.

Rice Breeding.

Selection Material.

(*i*) *Selection in Zinya.*—The two improved strains, Z-149 and Z-242, were again compared on small plots with the unselected Zinya variety and K-226 in 8 replications. This year none of the strains shows significant differences. However, Z-242 gives the highest yield. The statistical comparison of the last with this year's result shows that the two seasons differed greatly, the variance between the two being very much higher than the residual.

From the second lot 30 promising selections were compared in row replications nine times. Of these, 4 are oustanding. These and some second best selections will be compared again.

(*ii*) *Selection in Bhadas.*—The six best strains from the last year's lot were compared in row replications with B-52 and with B-79 from Ratnagiri. The strains show significant yield differences. The selection I-B-12-11 is significantly superior to the general mean. The trials of the best selections will be continued.

From the second lot, 16 out of 45 selections appear promising. These will be again compared with standard checks.

The synthetic Bhadas-like selections proved poor yielding, although they were higher in tillering than the standard Bhadas strains. These have been rejected.

(*iii*) *Selection in Kada.*—Out of the 14 selections only one appears promising. Selections have again been made from fresh material.

(*iv*) *Selection in Jirbuti.*—Out of the 43 selections 3 appear outstanding. These will be tested in row replications next year. New selections from fresh material have also been obtained during the year under report.

(*v*) *Selection in Mahadi.*—This variety is coarse and red grained. It is cultivated by the poorer classes of farmers for home consumption. A selection in this variety has consistently given better yields over local Mahadi for the last two years under A B B A trials. Small quantities of seed will be available for field trials after one more year's trial on the farm.

Synthetic Material.

(*i*) *K*-42 × *Krishnasal.*—Out of the 11 selections grown in the F_6 generation 2 appear promising. Purification of these will be continued.

(*ii*) *K*-42 × *K*-226 : *K*-42 × *B*-52 *and K*-226 × *B*-52.—These crosses were in the F_6 generation during the year under report. Desirable derivatives were compared with K-42 in 8 replications. None of them exceeds the standard strain which was significantly superior to the general mean. Trials of the promising strains will be continued.

(*iii*) *K*-42 × *K*-414 *and K*-226 × *K*-414.—Promising selections were compared this year in rows. None of them, however, was better yielding than K-42. Some of them, however, are finer in grain and closely follow the standard strain. Further trials will be conducted with the promising strains.

(*iv*) *K*-39 × *K*-164.—The early selections proved disappointing and have therefore been discarded altogether.

The strain K-501 has now been purified. Five hundred cultures were grown during the year. Only one late plant was found which appears to be a rogue. The strain will now be released for district trials and will be watched further for purity.

(*v*) *B*-211 × *Sabour-2.*—Out of the 47 selections, 3 appear promising. These will be further purified.

(*vi*) *P*-6 × K-79.—From this cross two moth-resistant types have been obtained. These will be further tested. A higher yielding type than P-6 has also been obtained. Further purification and yield comparisons will be continued.

Yield trials in Districts.

(*i*) *Gujarat Division.*—The yield trials were a complete failure due to absence of rains in July and August. The trials of K-540 and K-501 will be undertaken next year.

(*ii*) *South Central Division.*—The trials of K-540 were replicated the second year in the Ratnagiri District. There were five trials. At one place the Kolamba and the local strain gave equal yields, at two places it was less in yield by 4 to 6 per cent., while in two other localities K-540

showed increases of 12 to 20 per cent. The average yields of K-540 and the local per acre are 1,604 lbs. and 1,531 lbs. respectively.

Kolamba-540 was also compared at two places in Khed Taluka, and at both the places it gave higher yields by 14 and 16 per cent.

The trials will be continued.

Multiplication of seed.

The experimental area of the Rice Breeding Station is only 4 acres. Seed multiplication is therefore done on a small scale. As 4 to 5 strains have to be multiplied, small quantities of each are produced. During the year the various Kolamba strains, K-184, K-540, K-42 and K-226 were multiplied. All the seed of K-42, K-226 and K-184 is supplied to the Deputy Director, N. C. D.; while seed of K-540 is supplied to the Deputy Directors, Gujarat, N. C. D. and S. C. D. Altogether 2,040 lbs. of seed was supplied during the year.

Bajari Breeding.

Inbreeding of bajari.

Since the transfer of bajari work from Poona to Niphad in 1932, breeding work has been started again. As the crop is highly cross-fertilized, intensive inbreeding has been resorted to attain morphological purity. These studies during the last four years have revealed the following behaviour of the inbred bajari material:—

(*i*) *Lack of purity.*—Although very careful inbreeding has been done for four generations, morphological purity has not been obtained to the extent expected. This is due to certain amount of contamination by foreign pollen through muslin bags, which were being employed to self-fertilize the plants. Evidence on this point was collected from natural crosses between the local and African varieties, which show the phenomenon of xenia. Grains showing immediate influence of foreign pollen under bag were a clear evidence that the method of bagging bajari plants was imperfect. These experiences will now be utilized not only in modifying the method of bagging, but also in resorting to various methods of group-breeding, mass-breeding etc.

(*ii*) *Performance of inbred lines.*—A number of promising inbred cultures were available for yield comparisons during the year. None of them was as good as or better than the local on line basis, although some of them were superior in earhead and grain characters. Careful comparisons showed that inbred material suffers from greater diversification of plant material. While the local has, as far as yield is concerned, a population almost uniformly laden with well-filled grain. If we are able to eliminate substantially disabled plants from the population of the inbred material our object will be achieved.

Trials of African bajari.

The African bajari and the Niphad local were compared ten times at 1, 2, 3, 4 and 6 lbs. seed rates per acre in half guntha plots. The statistical analysis showed that (1) in yield of grain they do not differ significantly ; but (2) in yield of fodder the varieties differ significantly ; (3) the varieties show significant differential response to different seed rates ; (4) the African has a significantly smaller size of grain than Niphad local and that (5) the African has a lower bushel weight than the Niphad local. The information is summarized in the table below :—

Character.	Variety.	Seed rates per acre in lbs.					Remarks.
		1	2	3	4	6	
(1) Grain in lbs. per acre.	Local ..	495	595	630	645	600	
	African ..	605	615	645	605	535	
(2) Fodder in lbs. per acre.	Local ..	1,048	1,248	1,312	1,376	1,456	
	African ..	1,328	1,408	1,552	1,544	1,680	
(3) No. of grains per gramme.	Local ..	133	145	151	173	193	
	African. ..	156	205	219	247	267	
(4) Bushel weight in lbs.	Local ..	66·4	65·5	65·1	64·8	63·8	Not analysed.
	African ..	64·3	60·3	59·0	58·0	57·9	

Wheat Breeding.

Synthetic Material.

(*i*) *Natural crosses.*—From a natural cross of Bansipalli-809, a strain, B-G-8-1, has been isolated. It was compared 10 times with standard strains and local Bansi on one guntha plots. The strains showed significant strain differences. The calculated yields per acre are shown below :—

Table I.

Comparison of B-G-8-1 with standard strains and local Bansi during the year 1936–37.

Yield per acre in lbs.	Bansipalli 808.	B-G-8-1.	Bansi 168.	Local Bansi.	S. E. of the treatment Mean in lbs.	Critical difference for significance–lbs.
Grain ..	965	753	502	595	27	79
Straw ..	1,420	1,622	1,403	1,381	38	112

All the strains, except Bansipalli-808, were very severely attacked by rust. This has enabled the Bansipalli wheat to outyield the new wheat this year. Last year B-G-8-1 was superior in yield to Bansipalli-808 by 11 per cent. The trials will be continued.

(*ii*) *Baxi* × *Khapli*-568.—From these crosses five strains have been obtained and were compared for the third time with the Baxi strain, S. P. 33, during the year under report. The strain 17-56-63 has given higher yields than others. The strain S. P. 33 suffered more from rust than the synthetic strains. The yields per acre are reproduced below :—

TABLE II.

Comparison of Baxipalli strains with S. P. 33 during the year 1936–37.

Strains.	17–56 –6	17–56 –45	17–56 –62	17–56 –63	17–56 –112	S. P. 33.	S.E. of the treatment Mean in lbs.	Critical difference for significance—lbs.
Yield of grain in lbs. per acre.	1,270	1,300	1,125	1,316	1,300	987	62	179

(*iii*) *Baxi* × *Bansipalli*-808.—Four hundred and twenty-five F_4 cultures were grown. Out of these, 96 desirable lines have been retained for further use. The best cultures will be compared in row replications next year.

(*iv*) *Bansipalli*-809 × *Pusa*-4.—From this cross higher yielding, larger grained and non-shedding types like Pusa-4 have been obtained. These are still segregating for length of awns. Purification and comparison of the synthetic strains will be continued.

(*v*) *Bansipalli*-808 × *Polish*.—Promising segregates have been obtained from this cross. It appears that it will be possible to combine earliness and larger size of grain.

(*vi*) *Bansipalli*-808 × *Punjab-I*.—This cross does not appear much promising, but some promising selections have been obtained.

Black Stem rust of Wheat.

(*i*) *Differential hosts*.—The various hosts were grown during the year. Crosses of some have been made with our best wheats.

(*ii*) *Selection in Khapli wheat*.—All the 97 selections were grown during the season. These were affected by rust slightly during the later period of their life. Fresh selections have been made.

(*iii*) *Hybridization*.—The F_1 plants from the crosses of immune Russian wheats and the improved wheats turned out to be completely

sterile. Out of 1,000 back-cross pollinations no seed was obtained. From some out-crosses of the F_1 plants some seeds have been obtained. These will be grown further.

District trials.

(*i*) *Gujarat Division.*—Trials could not be taken under dry conditions due to lack of sufficient soil moisture.

(*ii*) *North Central Division.*—No wheat strains are being compared now in this division.

(*iii*) *South Central Division.*—The two Bansipalli strains, 808 and 809 were compared with local varieties. The season was very abnormal, there being general failure of the monsoon. The wheat crop had to grow only on 3 to 4 inches of rainfall received in the first half of November. Bansipalli-808 was compared at 10 places in Akola, Parner and Newasa talukas of Ahmednagar district. Bansipalli-809 was compared also at 3 places in the Parner taluka. It gave slightly more yield than local varieties. Bansipalli-808 has, however, given much higher yield over local everywhere, ranging from 6 to 1,400 per cent.

The trials will be continued.

(*iv*) *Southern Division.*—Bansipalli-808 was compared at 13 places in this division. In the Chikodi taluka the crop failed at two places out of three trials. At the third place the improved strain gave 122 lbs. per acre as against 200 lbs. of the local wheat.

In the Parasgad taluka of the Belgaum district there were seven comparisons. Bansipalli-808 is equal in yield at one place and exceeds at the other places from 6·5 to 29·3 per cent. In Gokak, Navalgund and Bijapur talukas only one comparison at each place was made, and at all these places the synthetic strain exceeded the local in yield by 7 to 30 per cent. The average yield of Bansipalli-808 is 367 lbs. and that of the local 332 lbs. per acre.

Multiplication of Seed.

The standard strain Bansipalli-808, Bansi-168 and Bansi-224 were multiplied on one acre each. In addition, the leased area of the Cereal Breeding Station was also got sown under Bansipalli-808. The produce from this area was supplied to the Deputy Director of Agriculture, Nasik, along with 300 lbs. of each of the above strains from the farm produce. Altogether 2,682 lbs. of seed was distributed to various Deputy Directors of Agriculture.

GRAM BREEDING.

Selections.

(*i*) *Yield trials.*—The four early strains, G-258, G-397, G-693 and G-746 and the two late selections G-130 and G-158 were replicated on small scale four times with local in 1935–36 and again in 1936–37 on

one-fourth guntha plots. The early selections were higher yielding and during the year under report G-397 and the local have given significantly higher yields than the general mean. The trials will be continued.

A new selection, G-316, has given larger yields over the local in row trials. Besides, it has bigger grains with more attractive yellow colour than the above selections.

Breeding of Minor Crops.

(*i*) *Val*—(*a*) *Old selections.*—The selections were compared in a Latin Square design, but due to late sowing, caused by late rains in November, the experiment was vitiated. The trials will be again undertaken next year.

(*b*) *New selections.*—Out of the three new selections, one proved significantly higher yielding over the local in eight row replications. It will be compared on a larger scale next year.

(*c*) *Hybridization.*—The crosses of the Madras type with local strains were grown in the F_3 generation. Both pedigree and bulk selection is being made.

(*ii*) *Rala* (*Setaria italica*).—Rala is generally grown in lines in fields of bajri and is an important subsidiary crop. Both grain and straw are useful to the cultivator. Improvement of the crop is being made on a small scale and the following results have been achieved so far.

(*a*) *Old selections.*—Out of the four strains with different grain colours one is earlier than local by about a week and gives equally good yields. It has uniform large yellow grains. This strain will be suitable for lighter types of soils.

(*b*) *New selections.*—Some new selections during the year have shown indications of better yield than the local.

(*iii*) *Tur* (*Cajanus indicus*).—Tur is an important subsidiary crop and is extensively grown in rows in fields of bajri. Selection in the crop was commenced in 1934-35.

Some promising strains were tried in 10 replications with the local. The red grained selection, T-24, has given significantly higher yield over the general mean. This strain has been consistently better yielding in row trials. The trials will be continued.

(*iv*) *Linseed.*—This is an important crop in the Nasik district and is either grown alone or around the wheat fields. Simple selection work is being done since 1933-34. A selection from the local Kundewadi material has given 13 per cent. higher yield and is significantly superior to the local variety. The trials will be continued.

Co-operative Studies.

(*i*) *Wheat rust.*—Stationery slide exposures were made throughout the season. The exposed slides were sent to Dr. K. C. Mehta, Agra.

(*ii*) *Agricultural Meteorological observations.*—Precision experiments on rice were continued and the results were supplied to the Agricultural Meteorologist, Poona.

(*iii*) *Vernalization.*—Seed of an improved wheat strain, supplied by the section, was treated by the Economic Botanist to Government, Poona. It was grown for him on the Cereal Breeding Station, but as the germination was defective no results could be obtained.

PUBLICATIONS.

(1) Kadam, B. S., (1936) .. Genic analysis of rice, I. Grain shedding, *Proc. Ind. Aca. Sci.*, IV (3), Sec. B, 224–229, 1 pl.

(2) Kadam, B. S., (1936) .. An anthocyanin inhibitor in rice, *J. Heredity*, XXVII (10): 405-408.

(3) Kadam, B. S., (1936) .. Genetics of the Bansi wheat of the Bombay-Deccan and a synthetic Khapli—Part I. *Proc. Ind. Aca. Sci.* IV (5), Sec. B., 357-369.

(4) Kadam, B. S., (1937) .. A new strain of Kolamba rice, *Current Science*, V (7): 389-390.

(5) Kadam, B. S., (1937) .. Genes for dwarfing in rice, *Nature*, Vol. 139 (No. 3529): 1070.

(6) Kadam, B. S., R. J. Kalamkar, and V. K. Patankar, (1937). Estimation of rice yields by sampling, *Current Science.* V (10): 533-534.

(7) Kadam, B. S. and R. K. Kulkarni, (1937). Genetics of the Bansi wheat of the Bombay-Deccan and a synthetic Khapli—Part II, *Proc. Ind. Aca. Sci.*, V (5), Sec. B.: 169-182.

(8) Kadam, B. S., G. G. Patil and V. K. Patankar, (1937). Heterosis in rice, *Ind. Journ. Agric. Sci.*, VII (1): 118-125.

(9) Kulkarni, R. K., S. S. Bose and P. C. Mahalanobis, (1936). On the influence of shape and size of plots on the effective precision of field-experiments with Juar, *Ind. Journ. Agric. Sci.* VI (2): 460-474.

B. S. KADAM,

Crop Botanist to Government of Bombay, Karjat.

July 1936.

Programme of work under the Crop Botanist to Government of Bombay, Karjat, for the year 1937-38.

Rice Breeding.

(1) Selections from Zinya Bhadas, Kada, Jirbuti and Mahadi varieties will be further tested.

(2) Synthetic material from the various crosses will be continued further for purification and comparison.

(3) Yield trials of improved strains will be continued in various divisions.

Bajri Breeding.

(4) New methods of bagging and group-breeding, etc., will be undertaken.

(5) Promising in-bred lines will be compared.

(6) Comparison of the African variety with the local will be continued.

Wheat Breeding.

(7) Comparison of the new improved strains with others will be continued.

(8) Comparison of Baxipalli strains will be continued.

(9) Derivatives from various crosses will be further purified and tested.

(10) Material for black stem rust resistant wheats will be continued.

(11) Trials of improved strains in Gujarat and South-Central divisions will be continued.

Gram Breeding.

(12) Yield trials of old and new selections will be continued.

Breeding of minor crops.

(13) Investigations in *val* will be continued.

(14) Selections in *rala* will be compared in row trials.

(15) Trials of improved types of *tur* will be continued.

(16) Improved types of Linseed will be further compared.

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Abstracts of publications contributed by the section of the Crop Botanist to Government of Bombay, during the year 1936-37.

(1) KADAM, B. S., Genic analysis of rice, I. Grain shedding, *Proc. Ind. Aca. Sci.*, IV (3), Sec. B, 1 pl., 224-229, 1936.

A non-shedding Burmese variety was crossed with the local wild rice which completely sheds its grain. The character of the wild rice was completely dominant in F_1 and F_2 segregated in the ratio of 15 completely shedding : 1 non-shedding plants. The digenic ratio was confirmed in the F_3 generation. The genes for shedding are named Sh_1 and Sh_2.

(2) KADAM, B. S., An anthocyanin inhibitor in rice, *J. Heredity*, XXVII (10) : 405-408, 1936.

A fully purple variety, Nagkeshar, when crossed with a completely green variety gave F_1 plants with green leaf-blades but with coloured sheaths. In F_2 both green and purple plants were recovered. Among the greens, plants with coloured sheaths and totally green plants were found, the ratio being 9 : 3 : 4 ; the middle class representing the purples. The completely green plants bred true ; those with coloured sheaths and green leaf-blades bred pure, segregated in 3 sheath coloured : 1 pure green ; and 3 sheath coloured : 1 full purple and some behaved like F_1. The F_2 full purples also bred true and segregated in 3 purple : 1 full green. The behaviour of F_3 families showed that a specific inhibitor I, restricts anthocyanin in the leaf-blades caused by the anthocyanin gene, A.

(3) KADAM, B. S., Genetics of the Bansi wheat of the Bombay-Deccan and a synthetic Khapli—Part I., *Proc. Ind. Aca. Sci.*, IV (5), Sec. B, 357-369, 1936.

Two pure lines of the Bansi wheat of the Bombay-Deccan, Bansi-162 and Bansi-167, were crossed with a synthetic wheat, Khapli-568. The hairy glumes of the Khapli variety were mono-dominant to the smooth glumes of Bansi strains ; the gene pair causing the character is named Pp. P is completely linked with B which causes black awns in Khapli-568. The gene B is epistatic to $R_{g\text{-}a}$ in the awn region, the latter producing both red glumes and red awns. The recessive alleles of B and $R_{g\text{-}a}$ result in white glumed white awned plants. The red grains of Khapli are caused by a gene R_1, the recessive allele producing yellow grains of the Bansi strains. Except as noted above, all genes are inherited independently. Evidence is adduced to show that Kala-Khapli-568 must have originated from a cross between the ordinary Khapli and the Baxi wheat.

(4) KADAM, B. S., A new strain of Kolamba rice, *Current Science*, V (7) : 389-390, 1937.

A new synthetic mid-late strain, K-540, is described. The variety has generally given higher yields over coarse varieties such as Dodki, Dangarwel and Patni, although the strain is very fine, weighing 75-77 grains per gramme. Kolamba-540 ripens in 130 to 135 days and is now spreading in Thana, Kolaba and Ratnagiri districts.

(5) KADAM, B. S., Genes for dwarfing in rice, *Nature*, Vol. 139 (No. 3529): 1070, 1937.

A number of dwarf varieties, collected from various Provinces in India and foreign countries, were crossed in various combinations to determine the number of genes causing dwarfness. Five genes d_1, d_2, d_3, d_4 and d_5 have been recognised. The gene d_2 occurs most extensively.

(6) KADAM B. S., R. J. KALAMKAR and V. K. PATANKAR, Estimation of rice yields by sampling, *Current Science*, V (10); 533–534, 1937.

A number of rice fields in the vicinity of Karjat were marked out in 1/40 acre plots. These were divided into 3 sub-plots and 3 samples, each 3′ × 3′, were taken at random from each sub-plot. Afterwards the whole plots were harvested. Data were analysed according to the analysis of variance. The plot variance was very large indicating considerable soil differences from plot to plot. The mean yield per sampling unit was 34·69 quarter ozs. as compared to 34·38 from the actual harvest. The non-sampling error and the actual also agree very closely. The sampling technique furnished 92 per cent. of the total information.

(7) KADAM B. S., and R. K. KULKARNI, Genetics of the Bansi wheat of the Bombay-Deccan and a synthetic Khapli—Part II., *Proc. Ind. Aca. Sci.*, V (5), Sec. B, 169–182, 1937.

The anthocyanin pigment in Kala-Khapli-568 is caused by a gene A. The recessive allele producing plants like Bansi 168, which is colourless except in ligule and auricles. The tough rachis of Bansi-168 is mono-recessive to the fragile rachis in the Khapli parent. Minor genes influence the action of the gene pair, Tt, responsible for rachis nature. The early flowering of the Bansi parent was mono-dominant to the late flowering of Kala-Khapli-568. There was mainly mono-genic segregation in subsequent generations but the variability indicated the undoubted presence of subsidiary genes. The gene pair for flowering is named Ee.

(8) KADAM, B. S., G. G. PATIL and V. K. PATANKAR, Heterosis in rice, *Ind. Journ. Agric. Sci.*, VII (1): 118–125, 1937.

Data were collected from a number of crosses made primarily for economic purposes. Hybrid vigour in yield was found in some crosses, while no heterosis was observed for height of plants, tillering, panicle length and weight of the whole plant.

(9) KULKARNI, R. K., S. S. BOSE and P. C. MAHALANOBIS, On the influence of shape and size of plots on the effective precision of field-experiments with Juar, *Ind. Journ. Agric. Sci.*, VI (2): 460–474, 1936.

An acre of Jowar crop was harvested for three years in plots of 72·5′ × 3·75′ or 1/160th of an acre. Grouping of plots in blocks greatly increased the precision of plots. Long narrow plots had greater efficiency than wider plots of the same area. The standard errors decreased as the plot area increased but the loss in efficiency was not proportional. No appreciable correlation in yield was found from year to year.

B. S. KADAM,
Crop Botanist to Government of Bombay,
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APPENDIX K.

Summary of the work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1936–37.

Dr. B. N. Uppal held charge of the section throughout the year.

Mr. J. S. Malelu, Betelvine Investigator, and the temporary staff under the scheme for the investigation of betelvine wilt were transferred to the control of the Deputy Director of Agriculture, N. C. D., Nasik, due to the conclusion of the investigation work.

It is sad to record the untimely death of Mr. N. T. Kulkarni who did very valuable work as Sann Investigator and was jointly with me responsible for the isolation of a wilt immune strain of sann hemp. In the vacancy caused by the death of Mr. Kulkarni, Mr. S. P. Shah was appointed Sann Investigator until the 1st April 1937 when Mr. V. P. Bhide took over from him.

The Indian Central Cotton Committee have sanctioned a new scheme for the development of wilt resistant strains of cotton for the Surat area. Mr. S. P. Shah has been appointed Agricultural Overseer under this scheme.

Mr. K. F. Kheswalla, formerly Assistant in the Mycological Section of the Imperial Agricultural Research Institute, New Delhi, has been appointed Assistant Plant Pathologist for conducting investigations into "Koleroga" of betelnuts, with headquarters at Sirsi.

The posts of Assistant Plant Pathologist and Assistant Entomologist on the Bombay Virus Scheme have been advertised. It is hoped that these posts will be filled up very shortly.

Education.

The Plant Pathologist to the Government of Bombay was assisted by the Assistant Professor of Mycology in the teaching of plant pathology and agricultural bacteriology at the College of Agriculture, Poona.

In the curriculum for the degree of B.Sc. (Agri.), no specialisation in plant pathology or in any other subject has been provided. All students are now required to take a comprehensive course in plant pathology and in agricultural bacteriology. The new arrangements have increased the teaching work of this section, and the need for an additional post of Laboratory Assistant is badly felt.

During the year there were two special students engaged in research, one of whom was preparing for the D.Sc. of the University of Bombay.

Research.

1. *Wilt in betel vines.*—The investigation work for the control of wilt in betel vines was completed during the year. Briefly stated, five applications of Bordeaux mixture 2-2-50 give an effective control of wilt

at Bassein. The first application should be made at the time of planting in October-November, the second in May before the monsoon and the remaining three at one month intervals during the rainy season from June to September. To avoid waterlogging in the monsoon, suitable drains should be provided in each *wadi*, and the ends of each *haral* (row) should be opened into these drains before the rains set in. Between two plantings of betelvine, green manuring should be practised to improve the condition of the soil.

The betelvine wilt work has now entered on a stage of intensive propaganda and has therefore been transferred to the control of the Deputy Director of Agriculture, N. C. D., Nasik.

The results of the investigation work are being written up for publication as a Departmental bulletin.

2. *Fusarium wilt in sann hemp.*—Sann hemp is practically a self-sterile plant, and a simple method of cross pollination needs to be devised in order to multiply the seed of the wilt-immune strain. For this purpose the relative efficiency of the different species of bees was tested.

Sann hemp was grown in a small plot to attract bees, and the following species were found to visit sann hemp flowers : *Megachile anthracena*, *M. lanata*, *M. elizabetha*, *Apis dorsata* and *Ceratina viridissima*. Of these the bees belonging to the genera *Megachile* and *Apis* were found in great abundance, but *Ceratina viridissima* was rarely seen.

The relative efficiency of the bees belonging to the genera *Megachile* and *Apis* was tested. Apis bees were found to be more efficient than Megachile bees as regards the number of pods formed, but the seeds formed in such pods were poorly developed. In the Megachile-stimulated pods the seeds were well developed. This is probably due to the fact that Megachile bees have a better pollen-collecting mechanism on the underside of their abdomen than many other bees. In the case of Apis bee, the light weight of the bee prevents the stigma from coming in contact with foreign pollen deposited on its legs, with the result that the stimulation of the stigmatic surface merely results in self-fertilisation and the consequent poor development of the seed. The Apidæ are, however, more active than Megachile bees, which become slack under conditions of captivity. It is thus evident that Megachile bees are on the whole better suited for securing cross pollination in sann hemp since the use of Apis bees is likely to result in the sterility or deterioration of a strain after a few generations due to self-fertilisation.

The seed of the wilt-immune strain, D-IX, was multiplied in a large muslin cage, measuring 40 feet × 15 feet. The yield was much reduced due to an attack of insects and heavy late rains. The seed thus produced will be multiplied in the field at Dharwar where there is no danger of contamination as sann hemp is not generally grown in this area.

The mode of inheritance of wilt resistance in sann hemp is being studied, but the results of the crosses between resistant and susceptible plants are not yet available.

A paper entitled "Studies in Fusarium wilt of sann hemp. I. The physiology and biology of Fusarium vasinfectum Atk." has been accepted for publication in the Indian Journal of Agricultural Science.

3. *Powdery mildew of betel vine.*—Experiments on the control of powdery mildew were continued at Bassein. As reported last year, one application of sulphur of 200-mesh fineness made in the month of January effectively controlled the mildew in newly planted gardens. The dressing per acre was 30 lbs. In old gardens two applications are necessary, the first application to be made in the month of November and the second in January. The quantity of sulphur required for two applications has been reduced to 60 lbs. per acre.

A study of the causative organism of the powdery mildew is also being made.

4. *Powdery mildew of the Mango.*—A study of the causative organism of mango mildew has been completed, and the results are awaiting publication.

5. *Downy mildew of Rumex.*—This work has also been completed, and the results will shortly be published.

6. *Fig rust.*—Experiments on the control of fig rust at Saswad were continued. The fungicides used were Bordeaux mixture 3-3-50 and Sulsol in strengths of $2\frac{1}{2}$ in 100 and 3 in 100. Applications were made at one month intervals during the cold season. The results were inconclusive since there was little attack of rust during the year.

The Bordeaux mixture treatment, though very effective in controlling rust, was extremely disliked by growers since the fungicide leaves a residue on the fruit that resists brushing. The "spotted" fruits fetched a lower price in the market.

The slight bronzing of leaves caused by the application of sulphur fungicides is not objected to by the growers, and it is therefore proposed to give an extensive trial to Sulsol and sulphur dust during the next two seasons.

7. *Fruit rot and twig blight of Mango.*—This disease is due to a species of *Phoma*, which has been isolated from diseased fruits and twigs. The disease has been found to be widespread in the Bombay-Deccan.

In artificial inoculation tests, the fungus produced rot in fruits of different varieties of mangoes and of *Citrus sinensis* and *Citrus nobilis* var. *deliciosa*. Experiments on the inoculation of young seedlings of mango in pots are in progress.

The physiology of the causative organism is also being studied.

8. *Black rot of custard apple.*—A destructive rot of custard apple has been reported from all over the Presidency. The rot starts from the stalk-end and progresses rapidly under favourable conditions, sometimes involving the whole fruit. The fruit is susceptible at all stages of development.

A species of *Diplodia* has been isolated in pure culture, and its pathogenicity has been established. The physiology of the organism is being studied in detail.

9. *Bacterial blight of Soya Bean.*—This disease was first reported from the Jalgaon Farm. A bacterial organism has been isolated from diseased specimens, and its pathogenicity has been established on soya bean.

The disease usually appears on the leaves and sometimes on the petiole. It is characterised by light yellow to brown, circular, necrotic areas surrounded by a halo. In artificially inoculated plants, the symptoms appear at the end of 72 hours, and young leaves are less susceptible than half-grown or fully formed leaves. Infection readily occurs without wounding the host tissue. Of 20 varieties of soya bean tested, 12 were found to be susceptible. The physiology of the organism is being studied in detail.

10. *N-fixation in rice fields.*—This work has been continued during the year. The organism commonly found in the rice fields at Karjat is a typical *Azotobacter.*

Soil samples were collected from the rice fields at Karjat at 21-day intervals during the year. Quantitative estimations on Ashby's medium indicate that *Azotobacter* shows a marked periodicity in the different seasons. The organism progressively decreases in numbers as the season advances, being very abundant during the monsoon and early in the cold season and almost disappearing in the hot summer months. The organism was prominent in cultivated soil, moderately abundant in "rabbed" (heated by burning brushwood on the surface) soil and absent from virgin soil.

Experiments have shown that cultures of *Azotobacter* when inoculated into Ashby's solution in which roots of rice seedlings had been previously dipped for varying lengths of time ranging from 10 minutes to 10 days fixed progressively less amounts of nitrogen, thus indicating that rice roots in some manner interfered with the normal activity of *Azotobacter.* However, when rice seedlings and *Azotobacter* were simultaneously introduced in Ashby's solution, the activity of the organism in fixing atmospheric nitrogen was stimulated. Further work is in progress.

11. *Wilt in Lathyrus sativus.*—The pathogenicity of *Fusarium* sp. isolated from wilted plants of *Lathyrus sativus*, has been established. The morphology and the physiology of the organism are being studied. A plot of land has been treated with a heavy contamination of the fungus, and in the course of a year or two this plot will be ready for use in connexion with the selection of resistant plants of *Lathyrus sativus.*

12. *Cotton Wilt Breeding Scheme.*—Another glasshouse has been sanctioned by the Indian Central Cotton Committee in connexion with the selection of wilt-resistant strains of cotton for Khandesh.

(*I*) *Broach Section.*—(*a*) *B.D.* 8.—The seed from 14 healthy plants obtained in 1935–36 (2 of culture B.D. 8–6–27, 7 of culture B.D. 8–6–28 and 5 of culture B.D. 8–6–35) was tested separately in pots of infected soil, which were kept in a glasshouse at

25° to 26° C.; the temperature sometimes falling to 23° C. in the early hours of the morning. At the conclusion of the 50-day test during which 12,338 plants were under observation, only 17 plants remained free from leaf mottle and were transplanted in the infected bed. It may be remarked that a very large percentage of plants did not wilt but showed only the characteristic leaf mottle, but such plants were taken to be diseased. The progeny of the 17 plants will be tested in the glasshouse next year.

(*b*) *New Selection* 12.—Seeds of 32 plants obtained last year were tested in the glasshouse. In all 13,421 effective plants were under observation, and at the conclusion of the 50-day test period, 27 healthy plants were transplanted in the infected bed. The seeds of these plants will be further tested in the glasshouse next year.

(*c*) *Crosses with B.D.* 8.—Several crosses of B.D. 8 with other strains were also tested. In all 10,179 plants were under the test in the glasshouse, and promising selections have been made from these.

(*II*) *Jalgaon Section—(a) Million Dollar.*—The selfed seed of 38 plants of Million Dollar selected in the season 1935-36 was further tested in pot culture in a glasshouse, the temperature of which fluctuated from 20° to 26° C. Observations were made for 50 days, and at the conclusion of this period, 131 plants were found to be free from leaf mottle out of a population of 1,224 effective plants. These have been transplanted in the infected bed.

(*b*) *Other strains.*—Selection for wilt resistance has also been undertaken in strains of *Gossypium arboreum* var. *neglectum*, and for this purpose 59 strains were collected from all over the country including Burma. In all over 27,000 plants were tested in the glasshouse (20°to 26°C) and all strains except Chinese R_1 Spotless succumbed to wilt. Sixteen plants of this strain have been transplanted in the infected bed although they were not completely free from leaf mottle.

The object of this work is to select a highly wilt-resistant strain with a view to crossing it with the best N. V. selections of the Cotton Breeder at Jalgaon.

Surat Section.—The Indian Central Cotton Committee have sanctioned a scheme for the development of wilt-resistant varieties of cotton for the Surat area. Selection for wilt resistance will be made in 1027 A. L. F. and failing a suitable strain in this cotton, it is proposed to cross it with a highly wilt-resistant strain of B.D. 8.

A plot of land has been taken at Shera near Ankleshwar and is being treated with a heavy contamination of the fungus in the form of wilt compost. This plot will be used for testing wilt-resistant varieties of cotton.

13. *Bombay Virus Scheme.*—The posts of Assistant Plant Pathologist and of Assistant Entomologist were advertised through the Federal Public Service Commission. It is hoped that the final selection from among the candidates recommended by the Commission as being suitable for appointment will soon be made.

Arrangements for the building of an insect-proof glasshouse, an insectary and a potting shed for the virus work have been completed. Government have sanctioned the demolition of barrack No. 8 to permit of the glasshouses being constructed behind the research laboratories in the main building of the College of Agriculture.

14. *Koleroga of Betelnut.*—The staff sanctioned by the Government was appointed during the year. A research laboratory has been set up at Sirsi, the headquarters of the Assistant Plant Pathologist.

15. *Wheat Rust Scheme.*—A proposal has been submitted to the Imperial Council of Agricultural Research for a subsidy of Rs. 38,380 for five years in the first instance for the purpose of providing facilities for the testing of the rust reactions of different varieties of wheat. These facilities are urgently needed since the Crop Botanist in this Presidency is much handicapped in the breeding of wheat varieties resistant to black rust due to lack of suitable arrangements.

It is proposed to do the testing for eight months (from June to January) at Poona and during the hot months (from February to May) the work will be transferred to Matheran, a hill station delightfully situated on an outlier of the Western ghats. The summer temperature at Matheran never goes beyond 90° F. during the hottest time of the year. Adequate glasshouse facilities will be provided at both Poona and Matheran for this work.

16. *Betelvine anthracnose.*—In recent years anthracnose of betel vines has become very prevalent in the Deccan. The disease appears on the upper surface of the leaves as yellowish spots which are irregular in outline. On the undersurface of the leaves, greenish patches of the fungus are observed corresponding to the extent of the spots. The affected leaves ultimately turn yellow and drop.

A species of *Gloeosporium* has been isolated from affected leaves. The attack of anthracnose is intensified due to the infestation of roots of betelvines with nematodes, but it has yet not been determined whether the fungus is only a weak parasite which follows in the wake of nematode attack.

Bordeaux mixture spraying of leaves to control the disease gave inconclusive results because of the constant association of nematodes with the roots of diseased plants.

17. *Tobacco seed-bed diseases.*—In the Kaira district diseases of tobacco seedlings in seed-beds take a heavy toll every year. Experiments on the control of these diseases were made during the year, using various combinations of seed and soil treatments with copper sulphate solution and zinc oxide powder. The results of preliminary experiments indicate that a combination of seed and soil treatment with copper sulphate is likely to prove beneficial. Zinc oxide powder (which was dusted on the soil at the rate of 1 oz. per 2 square feet of the area after the seed was sown) had no effect on controlling infection.

Copper sulphate and cuprous oxide are being tested in various combinations.

Isolations from diseased seedlings are being made to determine the fungi mainly responsible for damping-off.

18. *"Panama" disease of bananas.*—Varietal trials of bananas have been taken up at Ale where "Panama" disease appears in a virulent form every year. These tests are intended to find a substitute for the variety "Son" which is highly susceptible. The results are not yet available.

Advisory Work.

A large number of enquiries on plant diseases were dealt with during the year, and advice was given promptly whenever required.

Arrangements to demonstrate specimens of plant diseases and the appliances for their control were made as usual at the agricultural shows in collaboration with the Divisional Deputy Directors of Agriculture.

The work on the disease survey of the Presidency was continued during the year.

Miscellany.

Necessary facilities were provided to Dr. K. C. Mehta for making stationary slide exposures at different stations in the Bombay Presidency in connexion with his studies on the dissemination of wheat rusts in India.

A crank type of duster, Peerless Dust Gun, has become very popular for the dusting of mangoes against mildew and hoppers and also for the dusting of peas and other crops. The demand for these hand dusters had grown to such an extent that very high prices were demanded by the firms in Bombay. Thanks to the manufacturers in the U. S. A. who agreed to give us special terms for large consignments, one hundred machines were imported departmentally and sold out within two months. These dusters are sold at the cost price of Rs. 38 each to the *bona fide* growers in the Presidency.

Dr. B. N. Uppal continued to work as the Secretary-Treasurer of the Agricultural Graduates' Employment Board and has been nominated for the same post for a further period of three years. He also acted again as Secretary of the Crop Research Committee of the Bombay Department of Agriculture.

Publications.

(1) Uppal, B. N., Kolhatkar, K. G., and Patel, M. K. Blight and Hollow-stem of Sorghum. *Ind. Jour. Agric. Sci.* 6, 1323–1324, 1936.
(2) Uppal, B. N., and Kulkarni, N. T. Studies in Fusarium Wilt in Sann Hemp. I. The physiology and biology of *Fusarium vasinfectum* Atk. *Ind. Jour. Agric. Sci.* 7 (accepted for publication).
(3) Uppal, B. N., Kamat, M. N., and Patel, M. K. The Systematic Position of *Oidiopsis taurica* (Lév.) Salmon. *Current Sci.* (in press).
(4) Gummosis of Citrus. Leaflet of the Bombay Department of Agriculture (in press).

B. N. UPPAL,
Plant Pathologist to Government.

Programme of Work under the Plant Pathologist to Government for the year 1937-38.

(1) *Fusarium wilt in sann hemp.*—The relative efficiency of bees in effecting pollination in sann hemp will be studied further. The F_1 of the cross between the immune and susceptible strains will be grown and studied as regards the inheritance of resistance. The selfed seed of the immune strain will be multiplied at Poona and also at Dharwar.

(2) *Powdery mildew of betelvine.*—Experiments with sulphur dusting will be continued for another year at Bassein. The causative organism will be studied further.

(3) *Fig rust.*—Extensive trials will be made with Sulsol and sulphur dust.

(4) *Fruit rot and twig blight of mango.*—Experiments on the inoculation of young seedlings of mango will be continued. The penetration of the host by the fungus will be studied. The physiology and morphology of the organism will be further studied.

(5) *Black rot of custard apple.*—The studies on the disease will be continued.

(6) *Bacterial blight of soya bean.*—The disease is being studied. The physiology of the organism is also being studied.

(7) *N-fixation in rice fields.*—This interesting work will be continued.

(8) *Wilt in Lathyrus sativus.*—The morphology and physiology of the organisms will be further studied. The work on the isolation of resistant strains of *Lathyrus sativus* will be taken up.

(9) *Cotton Wilt Breeding Scheme.*—(*a*) In the Broach section work on the production of homozygous wilt-resistant strains in B. D. 8 and N. S. 12 will be continued. (*b*) Similar work will be done for the Khandesh area. (*c*) The work on the isolation of wilt-resistant varieties in 1027 A. L. F. will be taken up for the Surat area. Crosses of 1027 with B. D. 8 will be tested in the infected plot at Shera.

(10) *Bombay Virus Scheme.*—The insect-proof glasshouse and an insectary will be built.

(11) *Koleroga of betelnut.*—The research on the life-history and alternate hosts of the fungus will be taken up at Sirsi.

(12) *Betelvine anthracnose.*—Experiments on control of the disease will be continued.

(13) *Seedling blight of tobacco.*—The work on control will be continued. Determinations will be made of the organisms responsible for damping-off of tobacco seedlings in seed-beds.

(14) "*Panama*" *disease of bananas.*—Varietal trials of bananas will be continued at Ale.

(15) *Wheat rust scheme.*—If the scheme is approved by the Imperial Council, glasshouses will be built at Poona and Matheran.

B. N. UPPAL,
Plant Pathologist to Government.

Abstracts of papers published during 1936-37.

(1) UPPAL, B. N., KOLHATKAR, K. G., and PATEL, M. K. : Blight and Hollow-stem of Sorghum. *Indi. Jour. Agric. Sci.* 6, 1323–1324, 1936.

Macrophomina phaseoli is shown to be responsible for a seedling blight and hollow-stem of *jowar*. The fungus enters the soil through feeding roots and ascends the stem and may be traced up to the ear-head. There is no external evidence of the disease until the plant approaches maturity. At this time infected plants are found to have hollow stalks and produce a characteristic sound as they are forcibly shaken by wind ; hence the disease has been given the name " hollow-stem ". Seedling blight is also common and may become very destructive under conditions of high soil-temperature and high soil-moisture content.

The disease is most active at high soil-temperature (35° C.) and high soil-moisture content, thus confirming the general experience that infection in *rabi jowar* follows periods of heavy rains and bigh temperature. The disease is more common in clayey soils than in wilt loams.

The morphology and physiology of the causative organism have been described.

B. N. UPPAL,
Plant Pathologist to Government.

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APPENDIX L.

Summary of Work done under the Live Stock Expert to Government for the Year 1936-37.

Personnel.—Mr. Edw. J. Bruen held charge of the Live Stock Section up to 30th March 1937, when he proceeded on eight months' leave and Mr. B. S. Patel took charge.

The work done by the Live Stock Expert to Government may be divided under the following headings :—

1. *Live Stock Work.*—Breeding of Cattle on farms and live-stock improvement in villages.

2. *Provincial Marketing Survey.*—This work was continued up to 4th February 1937, when it was handed over to the Professor of Agricultural Economics (Dr. Ghatge), College of Agriculture, Poona.

3. Rural Uplift Work as far as Live Stock Improvement is concerned.

4. Palghar Dairy District Scheme, Dairy farms and Institutions to supply milk to cities.

5. Live Stock Research financed by the Imperial Council of Agricultural Research.

The progress made during the year under each of the above headings is being reported separately.

The activities of this Section mainly are :—

(*i*) Advisory Work.
(*ii*) Propaganda and teaching in villages.
(*iii*) The breeding of pure bred stock and their improvement on Government subsidized and private cattle breeding farms.
(*iv*) The breeding and improvement of poultry at the Government Central Poultry Farm, Kirkee, and other private and Government aided farms.
(*v*) The improvement of Cattle in villages by placing out pure bred Premium bulls.
(*vi*) The improvement of village poultry by placing out improved stock in the shape of cocks and hens in villages.
(*vii*) The encouragement of keeping better stock by holding Cattle Shows, Rallies and Demonstrations.
(*viii*) Improvement of milch buffalo.
(*ix*) The registration of pure bred stock of the various breeds in Breed Herd Registers.
(*x*) Propaganda in the storage and utilisation of fodder in the form of hay and silage.
(*xi*) Working of His Excellency the Viceroy's Gift Bull Scheme.
(*xii*) Working of the Live Stock Improvement Act.

Advisory work.—The demand made on this section has been on an increase due to both the Rural Uplift Work and the new Scheme of His Excellency the Viceroy for improvement of village cattle. The latter has brought an additional responsibility on all the staff of this Section.

Propaganda.—The demand for better cattle, sheep and poultry, far exceeds our resources to supply the same. The work on live-stock improvement is increasing day by day and to this is added the responsibility of working the Gift Bull Scheme inaugurated by His Excellency the Viceroy. The work regarding placing out the Gift bulls in all Districts has increased to such an extent that it was impossible for the limited staff of the Live Stock Expert to manage the whole work, and therefore it has been decided to utilise the local agricultural staff of the Deputy Directors of Agriculture to do part of the work, viz., selecting proper agents and placing out the Gift bulls with them ; the staff of the Live Stock Expert being responsible for deciding the breed and type suitable for different tracts and selection of the Gift bulls. The Live Stock staff is also available to inspect the breeding bulls whenever any difficulty arises regarding the same. Besides, the Live Stock Expert has to advise on all live-stock problems including dairy and poultry industries. I am pleased to say that the Government have sanctioned the following additional staff to cope with the increased work :—

One Assistant Live Stock Expert (this Officer will be appointed shortly).
Eight Kamgars.
One Clerk.
Five Peons.

The table given below gives the position of the Premium Bulls. In addition to these, thirty bulls have been given out from the Village Improvement Funds made available by the Collectors.

	1935–36.	1936–37. Premium Bulls.
South Central Division ..	71	70
North Central Division. ..	67	31*
Southern Division ..	75	66
Northern Division ..	76	80
	289	247

Shows and Cattle Rallies.—Cattle Shows or Rallies play a very important part in the propaganda of the live-stock improvement. If we are to stimulate real interest amongst the local cattle breeders we must create healthy competitions by organising local cattle shows in

* The number in North Central Division has been greatly reduced owing to the fact that 36 bulls that were given out to Taluka Development Associations had to be discontinued as their period expired and fresh bulls were not given out to them as the system did not work satisfactorily.

the heart of the cattle breeding tracts and recognising good work by offering good prizes. It is the experience of the Department that such cattle shows lay down high standard of excellence for all the cattle breeders of the tract and help to raise the quality of cattle bred in the tract.

Cattle shows to be of real use, should be planned few months in advance and should be held at a convenient centre in the cattle tract and at a date suitable for the owners, so that all good cattle breeders can easily bring their cattle to the show.

Probably, two or three local shows are necessary in all the cattle breeding Districts. Fortunately the idea is taken up by some of the Collectors and the Village Uplift Committees to hold such cattle shows with good success. During the year 15 cattle shows were held as against 10 of the last year.

Registration of animals.—The following table gives the registrations of pure bred stock up to date :—

——	Number of animals registered up to 1935-36.	Number of animals registered during 1936-37.	Total up to the end of July 1937.
Northern Division	921	127	1,048
North Central Division	175	....	175
South Central Division	429	330	759
Southern Division	559	29	588
Total ..	2,084	486	2,570

The registration of cattle has not been quite so brisk during the year under report, but this is due to the fact that we have covered a considerable ground and it is only new births and stray animals overlooked before, that are now available for registration.

His Excellency the Viceroy's Gift Bull Scheme.—The appeal made by His Excellency the Viceroy for helping the villages with stud bulls has resulted in as many as 496 offers. During the year under report, following bulls were made available by Live Stock Section towards this Scheme :—

Division.	Number of Gift bulls given out.
Northern Division	22
North Central	39
South Central	7
Southern	22
	90

The greatest difficulty is in finding people to maintain the bulls particularly in villages where cattle breeding is not very much valued by

the cultivators. A plan to organise this work with a Presidency Association for Live Stock Improvement with its branches in Districts is in progress.

Application of the Live Stock Improvement Act, 1933.—The District Local Boards, Dharwar and East Khandesh, approved our proposal to apply the Act to few villages in these Districts. Accordingly, the Live Stock Improvement Act has been applied to four villages, viz., Motebennur and Sidenur of Dharwar District and Shirsoli and Mhaswad of East Khandesh District.

The Act is working well in the Dharwar District and the people now appreciate the application of the Act as it has protected the pure cows against breeding from undesirable bulls as 22 such bulls have been castrated. Whilst in East Khandesh District some difficulty was felt in providing sufficient breeding bulls. Sixty-two undesirable mongrel bulls have been castrated. In future, it will be desirable to apply the Act first in intensive cattle breeding villages, where pure cattle predominate, so that there may be no difficulty in providing sufficient breeding bulls from any other Schemes that supply Breeding Bulls.

During the year the Imperial Council of Agricultural Research set up a village inquiry into the cattle and milk production and consumption in Kankrej tract by an appointment of a Special Supervisor and ten Investigators for 5 to 6½ months under the supervision of the Live Stock Expert. The Supervisor went to Delhi with all original primary records of his inquiry to compile the final report at Delhi under the guidance of the Central Officer of the Imperial Council of Agricultural Research.

During the year Dr. N. C. Wright from England was invited by the Government of India to review the position of Dairying and the Development of Dairy Industry in India. Dr. Wright spent a day in Ahmedabad and a day in Anand and about 4 days in Bombay to see the City Milk trade and a day in Poona to see Agricultural Dairy and Military Dairy and City milk trade and Government Poultry Farm. His report to the Imperial Council of Agricultural Research is awaited with interest.

Northcote Cattle Farm, Chharodi.

Personnel.—Mr. B. B. Jamaspjina held charge of the farm throughout the year, except for 14 days during September.

Season.—Agriculturally speaking the year was a complete failure. Neither kharif nor rabi crops could be grown. During the year the total rainfall was 15·48". June and September rains only were in showers and effective. Unusually July and August rains were in drizzles and light which caused the failure of crops as well as grasses. However, heavy rains in September helped the growth of grasses to some extent.

Cultivation.—Several plots were sown twice but without any success. All kharif crops failed, and only a limited quantity of green fodder out of irrigated winter and spring sowing could be obtained.

Silage.—No cultivated crops were green and lush enough for silage making. Silos were therefore filled with grasses that were lush in

low-lying areas. Even the roughest grass—dabhro (*Eragrostis Cyanosuroides*)—which otherwise is either grazed by cattle or grows rank and rough and dries as waste, was used both for silage making and grazing. Three silos were filled with 173,558 lbs. of green stuff mostly consisting of dabhro and other grasses and a little of chaoli (cowpeas).

Crops.—Total area cultivated was 99½ acres, out of which 20 acres failed completely. The rest gave a very very poor yield. Out of this total area, 60 per cent. was sown under jowar, 17 per cent. under maize, 4 per cent. under bajri, 2 per cent. under groundnut, 5 per cent. under soya bean, 7 per cent. under several pulses, and the rest (5 per cent.) under irrigated crops.

During the year it was observed that among the graminæ, bajri was found the most resistant to draught; and among the pulses especially for fodder, chaoli or cowpeas did the best under draught.

Berseem.—Due to the expected erection of the new pumping plant, berseem had to be sown late, but yielded 38,318 lbs. per acre in 4 cuttings.

Oats and Peas.—Grown on ½ acre, it yielded 24,290 lbs. per acre in 2 cuttings.

Elephanta Grass.—Grown on ½ acre, it yielded throughout the year in 8 cuttings 64,526 lbs. per acre.

Hay-making.—Due to failure of rains and therefore failure of fodder and grasses, all possible corners and vantageous places on the farm were run over for cutting grasses for hay. The last showers of 5 inches in September just made it possible for grass to grow sparsely. Raking up the whole farm of about 2,000 acres including areas normally leased out, we could make only 233,100 lbs. of hay at Rs. 4-2-9 per 1,000 lbs. that is, at more than double the usual rate of Rs. 1-15-4 per 1,000 lbs. during 1935-36.

The strength of the herd during the year stood as under:—

Live-stock.	Opening.	Closing.
Stud bulls	4	8
Cows	83	80
Heifers	64	56
Young bulls	53	32
Male calves	31	48
Female calves	25	58
Buffalo bulls	24	41
Bullocks	53	57
Buffalo bullock	1	..
Total ..	338	380

The total strength increased by 42 heads, but the actual breeding herd (excluding all bullocks and castrated stock, and buffalo bulls which are merely reared up at the farm) increased by only 22 heads. All

cows that calved during the year were milked with the exception of one,—showing thereby that a herd which was a non-milking one sometime back, has become entirely a milking herd.

For breeding, the female stock at the farm is grouped in three sections, each section having its own set of selected stud bulls possessing special desirable qualities.

During the year seven heifers calved for the first time as against 12 heifers the previous year. All these heifers belong to the Mineral Mixture *versus* Common Salt Experiment. Their performance records are under study.

Number of births during the year was 64—29 males and 35 females. It is significant to note that there is a larger number of females born than males—an unusual feature this year; whereas normally always more males are born.

Deaths and Diseases.—The year under report is conspicuously very fortunate in having no epidemic disease whatever. Such a year is unprecedented. Even Foot and Mouth Disease which occurs at least once every year was also absent. There were 15 deaths during the year (4·1 per cent. over the whole herd), 7 of adults, 1 of an animal between 1 and 3 years of age, and 7 of young calves below 6 months of age, mostly from infantile diseases.

Sales.—The total number of animals disposed off was 31 with an addition of 2 Gift Bulls which were received from Radhanpur State. Average price realised per animal come to Rs. 67-12-0 as against Rs. 57-7-0 the previous year.

Bulls issued.—Premium, Gift and Village Improvement Scheme Bulls.

Twenty-three bulls detailed as under were issued during this year :—

6	Ahmedabad District (3 Premium Bulls + 3 Gift Bulls).
7	Kaira District (1 Premium Bull + 1 Premium Buffalo Bull + 5 Gift Buffalo Bulls).
3	Broach District (2 Premium Bulls + 1 Gift Bull).
5	Panch Mahals District (5 Village Improvement Scheme Bulls).
2	Surat District (2 Premium Bulls).
23	Total.

Cattle received.—Twenty-six animals were received by the farm to be reared, etc.

10	Buffalo male calves received from Buffalo Improvement Scheme (Anand Centre).
13	Buffalo male calves received from the Agricultural College Dairy, Kirkee.
1	Bull received from Sayla State as Gift Bull.
2	Bulls received from Radhanpur State as Gift Bulls.
26	Total receipts.

Breeding Policy.—The Breeding policy explained in the last year's report is being followed. Appendix I shows the improvement made and the part played by sires in their improvement. Regularity of calving is well maintained, every young cow calving second or third time dropping a calf at an interval of 1 year $\frac{3}{4}$ months as against 1 year $8\frac{1}{2}$ months originally. The aged animals show improvement in this point with every successive calving, by shortening the period between two calvings. Appendix VI bears this out very clearly.

Milk Production.—The total annual production of milk was 134,426 lbs. as against 134,909 lbs. the previous year. The average number of the adult cows in the herd was 81·08 out of which 38·54 was the average number of cows in milk on any day during the year. The average milk yield per adult cow of the herd comes to 1,657·9 lbs.

Milk-yielding Capacity.—During the year under report 18 cows have yielded over 3,000 lbs. of milk in a lactation, and have in addition suckled a calf.

Dairy Production and Disposal.—Appendix II attached gives the production and disposal of milk and milk products during the year.

Cattle Breeding Farm, Bankapur.

Personnel.—Mr. A. B. Gadagkar was the Manager of the farm throughout the year.

Season.—During the year there were no anti-monsoon showers and tillage had to wait until the break of monsoon. Monsoon started by the middle of June and ended by the middle of October. Rainfall during the year was 26·41 inches as against 20·20 inches of previous year. Rains during the first week of October were good for a start of rabi crops but there being no further rain, pulses failed. Season was favourable for Kharif crops and grasses.

Experiments—(*a*) *Brazillian Grasses.*—Two varieties of grasses, viz. Gordura and Jaragway, were transplanted but they made poor growth as they were only 4 months' old. Both are drought resistant as they continue to give green growth up to the end of January. Jaragway is taller and more drought resistant. Efforts will be made to grow this grass in the pasture land.

(*b*) *Indigenous Grasses.*—Elephanta grass was grown on 25 gunthas and gave 20,427 lbs. of green grass from 10 cuttings. Guinea grass was grown on 2 gunthas and gave 656 lbs. of green fodder. Most of these two grasses were turned into silage.

(*c*) Grasses from Bangalore were discontinued as they were not any better than our grasses.

Livestock.—During the year the farm maintained 155 heads of cattle as against 146 of last year as classified below :—

	Opening.	Closing.
Stud bulls	5	3
Cows	38	42
Heifers	33	28
Young bulls	21	35
Cow calves	13	20
Bull calves	20	13
Bullocks	16	10
Buffalo bull calves.. ..	..	4
Total ..	146	155

The whole herd is now uniform in colour, size and confirmation. The farm has now reached a stage of producing good bulls required for the tract. During the year six heifers calved at an average age of 3 years 5½ months as against 14 of last year. There were 36 calvings during the year against 33 of last year. During the year 5 Premium Bulls were supplied in the district.

Deaths and Diseases.—There was no outbreak of epidemic on the farm though Rinderpest occurred in the neighbouring villages. This is due to the preventive treatment against. Rinderpest. The farm was also free from Foot and Mouth trouble which was prevalent in the villages. Farm stock was protected against Black-quarter and Hæmorrhagic Septicaemia. There were 4 deaths during the year against 3 of last year.

Green Grass and Hay.—During the year 260,000 lbs. of green grass was fed to cattle against 188,000 lbs. of previous year. 5,508 lbs. of hay was made from about two acres and the grass land at Kalasgeri was not cut into hay for want of funds.

Ensilage.—During the year 6 kachha pits were filled with cultivated fodder to the extent of 510,765 lbs. as against 282,650 lbs. of last year. Out of this 80,000 lbs. was the grass and the rest were the cultivated fodders.

Fodder Crops.—The plots are being improved by levelling and bunding where necessary.

Maize.—Area under maize was 14 acres and 30 gunthas which gave 240,765 lbs. of green fodder. This was chaffed and put into silo pits. One acre of maize was kept for seed which yielded 1,700 lbs. of seed and some fodder.

Ragi or Nagali.—Area under ragi was 7 acres and 20 gunthas which yielded 1,75,000 lbs. of green fodder which was put into silo pit. The crop gave 8,537 lbs. of ratoon growth due to late rains. This fodder is much liked by cattle.

Jowar.—3 acres and 20 gunthas were under jowar and 2 acres grown as a second crop after maize. This yielded 28,900 lbs. of green fodder, 24,587 lbs. of semi-dry fodder, 2,684 lbs. of dry fodder and 3,030 lbs. of grain.

Soyabeans.—Mammoth yellow—This is an early variety, taking about 3 months to mature and seed. One acre and 20 gunthas gave 420 lbs. of seed and 440 lbs. of chaff. This has proved to be a poor yielder.

Large yellow—which is little later—22 gunthas gave 375 lbs. of grain and 660 lbs. of chaff. This is a better grower and will be grown on a larger scale.

Kulthi.—This was grown on 8 acres which gave 728 lbs. of grain and 1,138 lbs. of fodder. This year it was a poor crop for want of sufficient moisture in the soil after ragi was harvested.

Lucerne.—This was grown on 5 gunthas which gave 3,335 lbs. green fodder for calves.

Reanna Lexurianna.—This was grown for seed on one acre and 30 gunthas which gave 400 lbs. of seed and some dry fodder. This seems to be a poor grain crop. Its fodder yield will be compared with maize.

Government Central Poultry Farm, Kirkee.

Personnel.—Mr. V. C. Charanti was the Manager of the farm throughout the year.

Owing to the increase of work the post of Assistant Manager was continued during the year.

Livestock.—

There were 720 birds on the 31st March 1937, against 765 on 31st March 1936 (*vide* statement I).

New blood during the year.—One White Leghorn Cock was obtained from Devar Strain of England from Mr. Williams. Whilst, the purchase of new blood for the other breeds is still awaiting the funds.

Incubation.—Incubators were started on 23rd October 1936 and were closed down on 24th April 1937. During this period 1,015 chicks were hatched against 1,129 of the last year. Hatchability during the year was 80·05 per cent. against 76·44 of the last year.

Testing Pens.—18 White Leghorn, 6 Rhode Island Red and 6 Australorp pullets were kept in the single testing pens for testing the egg laying capacity for one year from 1st October 1936. Best layers will be selected for breeding for the next year. There was very little mortality in the testing pens during the year. Statement No. II gives the records of tested birds for 9 months.

Distribution.—The following number of birds, chicks and setting eggs, were sold during the year :—

—	Adult Birds.	Chicks.	Setting Eggs.
Government Institutions	344	40	256
Private Persons and Institutions	173	261	1,097
Total ..	517	301	1,353

Full details by Divisions and Districts are given in Statement III.

General.—The farm had very successful working year. The total income for the year under report amounted to Rs. 5,082-6-6 against Rs. 4,134-9-9 of the last year. The expenditure for the year was Rs. 3,668-0-0 as against Rs. 4,154-0-0 of the previous year. The expenditure includes the pay of the Manager. Such farm involves costly equipment and if a big central farm is to pay its way there must be sufficient demand for pure bred stock at fairly high prices for breeding purposes. In starting big Poultry farm by any individual or institution this fact has to be kept in mind. The farm has paid its way and has served as a central institution for supply of reliable pure stock and for teaching practical poultry farming. To get the full value of this farm the post of the Assistant Manager has to be made permanent. The cost of the Assistant Manager is met from the income and would not entail any extra burden to the State finances.

Teaching.—16 students from different districts were trained during the year. Out of these, 5 students were from outside the Bombay Presidency. The demand for practical training in Poultry keeping has increased, but the farm is handicapped in not having any working room or quarters for the students. The poultry student has to attend to his work from morning to night and quarters on the site are essential.

STATEMENT I.

Statement showing the strength of flock on the Government Central Poultry Farm, Kirkee, during the year.

Serial number.	Breed.	Cocks.	Hens.	Cockerels.	Pullets.	Chicks.	Total.
1	White Leghorns ..	2	62	79	79	123	345
2	White Wyandottes ..	1	12	4	9	29	55
3	Rhode Island Reds ..	1	14	16	15	128	174
4	Australorps ..	1	9	6	18	94	128
5	Black Minorcas ..	..	5	3	..	..	8
6	Aseels	..	..	..	..	7	7
7	Well Summers ..	..	..	..	..	3	3
	Grand Total ..	5	102	108	121	384	720

STATEMENT II.

Statement showing the individual egg laying record of the Testing Pen Hens on the Government Central Poultry Farm, Kirkee (from 1st October 1936 to 30th June 1937 both days inclusive), during the year 1936-37.

Pen number.	Hen number.	Breed.	Total number of eggs laid in 9 months (from 1st October 1936 to 30th June 1937).	Total weight of eggs in oz.	Average number of eggs per hen per year on the bases of 9 months record.	Average weight of an egg in oz.	Remarks.
			Heavy Breeds.				
1	2	White Wyandotte.	*194*	*396*	*259*	*2·04*	
4	8	Do. ..	146	271	195	1·85	One time broody.
7	14	Do. ..	*162*	*318*	*216*	*1·96*	
10	20	Do. ..	148	280	197	1·88	Two times broody.
13	26	Died.	Died.				
16	32	White Wyandotte.	66	135	88	2·04	
	5		716	1,400	190·93	1·95	
2	4	Rhode Island Red.	*115*	*228*	*153·00*	*1·98*	Two times broody.
5	10	Do. ..	111	211	148	1·99	Three times broody.
8	16	Do. ..	*121*	*214*	*161*	*1·76*	One time broody.
11	22	Do. ..	*171*	*327*	*228*	*1·91*	Do.
14	28	Do. ..	110	210	147	1·90	Two times broody.
17	34	Do. ..	106	213	141	2·00	Three times broody.
	6		734	1,403	163·11	1·91	
3	6	Australorp ..	*132*	*263*	*176*	*1·99*	
6	12	Do. ..	*126*	*289*	*168*	*2·29*	One time broody.
9	18	Do. ..	109	233	145	2·13	Do.
12	24	Do. ..	102	213	136	2·08	Do.
15	30	Do. ..	99	202	132	2·04	
18	36	Do. ..	100	187	133	1·88	
	6		668	1,387	147·88	2·07	
	Average of Heavy Breeds (White Wyandotte and Rhode Island Red, Australorp).		2,118	4,190	165·11	1·97	
Total average ·34		e of Heavy and Light Breeds—	4,865	9,987	143·08	2·05	

STATEMENT II—*contd.*

Pen number.	Hen number.	Breed.	Total number of eggs laid in 9 months (from 1st October 1936 to 30th June 1937).	Total weight of eggs in oz.	Average number of eggs per hen per year on the bases of 9 months record.	Average weight of an egg in oz.	Remaks.
			Light	*Breed.*			
1	1	White Leghorn	Died.				
2	3	Do. ..	*171*	*376*	*228*	*2·19*	
3	5	Do. ..	138	304	184	2·20	
4	7	Do. ..	*203*	*391*	*271*	*1·92*	
5	9	Do. ..	*184*	*386*	*245*	*2·09*	
6	11	Do. ..	154	337	205	2·18	
7	13	Do. ..	155	325	207	2·09	
8	15	Do. ..	167	337	223	2·01	
9	17	Do. ..	160	327	213	2·04	
10	19	Do. ..	*176*	*341*	*235*	*1·93*	
11	21	Do. ..	142	291	189	2·04	One time broody.
12	23	Do. ..	*186*	*392*	*248*	*2·10*	
13	25	Do. ..	*182*	*378*	*243*	*2·07*	
14	27	Do. ..	88	188	117	2·13	
15	29	Do. ..	*167*	*363*	*223*	*2·17*	
16	31	Do. ..	135	323	180	2·39	
17	33	Do. ..	*175*	*410*	*233*	*2·34*	
18	35	Do. ..	164	328	219	2·00	
Total..	17		*2,747**	*5,797**	*3,663** (215·45)	*2·11**	

* This gives an average of 161·5 eggs per hen over 9 months.
The average of the best 8 birds is 180 eggs over 9 months.

(1) Hen No. 7 has the highest egg record of 271, weighing 1·92 oz. each.
(2) Hen No. 33 has the highest total weights for 233 eggs of 2·34 oz. each.
(3) Hen No. 3, 9, 19, 23, 25 and 29 are about equal and yield more than 220 eggs.
(4) The average per hen tested has come to 215·45 eggs in a year with an average weight of 2 ozs.
(5) Hen No. 2 and 14 of White Wyandotte give good production.
(6) Hen No. 4, 16 and 22 of Rhode Island Red give good production.

STATEMENT III.

Statement showing stock of birds and setting eggs supplied to the Institutions and private persons during the year 1936-37.

Serial number.	To whom supplied.	Number of birds or chicks.	Number of setting eggs.
	District Ahmedabad.		
1	Private Persons	1	6
	District Broach.		
1	Imperial Council of Agricultural Research, Poultry Research Station, Ankleshwar.	29	..
2	Private Persons	5	12
	District Surat.		
1	Private Persons	75	..
	District Kaira.		
1	Private Persons	..	15
	Bombay Town proper.		
1	Private Persons	62	207
	District Thana.		
1	Private Persons	12	84
	District Kolaba.		
1	Village Improvement Scheme in Karjat Taluka under the Live Stock Expert to Government, Bombay Presidency, Poona.	15	..
2	The Rice Specialist, Karjat	10	84
3	The Mamlatdar, Panwel	3	36
4	Private Persons	15	50
	District West Khandesh.		
1	Agricultural School, Dhulia	5	..
2	Private Persons	6	..
	District East Khandesh.		
1	Private Persons	..	24

STATEMENT III—*contd.*

Serial number.	To whom supplied.	Number of birds or chicks.	Number of setting eggs.
	District Nasik.		
1	The Superintendent, Nasik Jail	4	..
2	Private Persons	15	..
3	The District Agricultural Overseer, Nasik	..	6
4	The Agricultural Kamgar, Sinner	..	24
5	The District Agricultural Overseer, Malegaon ..	..	48
6	Private Persons	5	66
	District Poona.		
1	Imperial Council of Agricultural Research, Poultry Research Centre, Kirkee.	54	..
2	Village Improvement Scheme, Lonikand, under the Live Stock Expert to Government, Bombay Presidency, Poona.	6	..
3	Village Improvement Scheme, Talegaon Dabhade, under the Live Stock Expert to Government, Bombay Presidency, Poona.	25	..
4	Government House Dairy, Kirkee	40	..
5	Private Persons	2	..
6	Village Improvement Scheme, Fursungi, under the Collector of Poona.	..	24
7	Private Persons	203	497
	District Satara.		
1	Village Improvement Scheme, Islampur Centre, under the Live Stock Expert to Government, Bombay Presidency, Poona.	73	..
2	Village Improvement Scheme, Koregaon, under the supervision of the Taluka Agricultural Development Association.	12	..
3	Village Improvement Scheme, Panchgani, under the Live Stock Expert to Government, Bombay Presidency, Poona.	20	..
4	Private Persons	7	8

STATEMENT III—*concld.*

Serial number.	To whom supplied.	Number of birds or chicks.	Number of setting eggs.
	District Sholapur.		
1	Village Improvement Scheme, Javla, Taluka Sangola..	12	..
2	Village Improvement Scheme, Pandharpur, under the Live Stock Expert to Government, Bombay Presidency, Poona.	6	..
3	Private Persons	3	1[illegible]
	District Ahmednagar.		
1	Imperial Council of Agricultural Research, Poultry Research Centre, Vadala.	27	..
2	Private Persons	..	3[illegible]
	District Dharwar.		
1	Village Improvement Scheme, Uppin-Betegiri, under the Live Stock Expert to Government, Bombay Presidency, Poona.	20	..
2	Village Improvement Scheme, (Dharwar), under the Live Stock Expert to Government, Bombay Presidency, Poona.	4	..
3	Private Persons	..	42
	District Belgaum.		
1	Village Improvement Scheme, Gokak, under the Taluka Agricultural Development Association.	7	..
2	Village Improvement Scheme, Kanabargi, under the Live Stock Expert to Government, Bombay Presidency, Poona.	12	..
3	Village Improvement Scheme, (Belgaum), under the Live Stock Expert to Government, Bombay Presidency, Poona.	..	34
	States and Outside Bombay Presidency.		
1	Private Persons	23	46
	Grand Total ..	818	1,353

Taluka Development Association Cattle Breeding Farms.

1. The Sanghavi Farm worked by the Taluka Development Association has received a serious setback due to contagious abortion. Unfortunately no satisfactory solution has been found yet regarding the abortion on the farm.

2. The Pimple farm for Nimar breed worked by Taluka Development Association, Jalgaon, has been making a steady progress. The Collector, East Khandesh, Jalgaon, gave again a grant of Rs. 3,500 for a pumping plant to facilitate growing of irrigated crops.

The farm has 112 heads of Nimar Cattle consisting of 42 cows, 2 breeding bulls and 36 heifers and 32 bull calves. It supplied four breeding bulls to His Excellency's Gift Bull Scheme and a batch of eight bulls is ready to go out. The Nimar breed is purely a work animal. In the year under report milking of the cows was started and it is hoped that by degrees a some sort of dual purpose herd would be established. Still the management of the farm as regards production of good fodder crops and feeding of cattle has to be reorganised. The farm sells lot of grass and some grain and unless the farm devotes entirely to growing of crops only for feeding the farm stock, the farm Manager cannot devote full attention to the cattle work on the farm.

The Jamnapari goats are doing very well and the results of the milking abilities are awaited.

3. The Gangapuri Farm for Nimar breed managed by Taluka Development Association, Jamner, has been working satisfactorily. It has 70 heads of Nimar cattle, consisting of 23 cows, 24 heifers, 21 bull calves and 2 breeding bulls. The farm supplied four bulls and eight are ready to go out.

As per G. R., R. D., No. 377/33 of 24th March 1936, the Government of Bombay have approved of a Scheme to subsidise the three cattle farms in Khandesh at the rate of Re. 1 for every three rupees spent on the management of the farm subject to the maximum of Rs. 1,000 a year and subject to the grant not to exceed the deficit in the working expenses of the farm.

Rural Uplift Work.

Under Rural Uplift Work the following Schemes have been under operation :—

Scheme No. 1.—Improvement of the Buffalo and its milk supply.

Scheme No. 2.—Improvement of Poultry in villages.

Scheme No. 3.—Encouragement of pedigree poultry keeping in villages by premia to poultry farms.

Scheme No. 4.—Co-operative eggs collecting, grading and marketing.

The grants for the first and the last were stopped by the Imperial Government at the end of the financial year. Fortunately the Buffalo Improvement work has been continued from our provincial budget.

SCHEME No. 1—*Note on the Improvement of the Buffalo to help the cultivator.*

Buffalo is the main source of milk supply of the country as would be seen from the following facts :—

Recent enquiries have shown that about 82 per cent. of the milk, produced in the Bombay Presidency, comes from the buffalo, that the Northern part of the Bombay Presidency supplies about 80 per cent. of the table butter requirements of India, Burma and Ceylon ; and 72 per cent. of " Khava " requirements of the cities of the Presidency and that our cities largely depend upon the buffalo for their demand for milk, country butter and ghee.

The cultivator keeps the buffalo as a dairy animal and the consumer also demands the milk and ghee produced by the buffalo.

In spite of this, the buffalo is deteriorating very fast as very little attention is paid to the selection and breeding of the buffalo by the cultivator.

Under these circumstances the Live Stock Expert felt that something should be done to improve the buffalo so that the cultivator may get the better income from the animal. With this object in view a five years' scheme for improving the buffalo was sanctioned by the Government of India in 1935 at a cost of Rs. 41,700 from the Rural Uplift grant allotted to the Bombay Presidency by the Government of India.

The Scheme provided for testing a large number of cultivators' buffaloes for milk and butter-fat yield periodically with a view to ascertain for the cultivator, which of his buffaloes pay and which do not. Secondly, for selecting the bull calves for breeding purposes from the best milkers. And thirdly, for demonstrating to the people the best way of disposing off their milk.

A special staff was engaged to carry out this Scheme. Though the Scheme came into operation in November 1935, great deal of time was spent in preliminary propaganda to get over the superstition against the testing and recording of the milk of the buffalo in certain parts. After a good deal of preliminary enquiry, the villages known for keeping good buffaloes and for supplying large quantities of dairy produce were selected in different parts of the Bombay Presidency.

Centres of Work.

Thirty-six villages were selected as under :—

Seven villages were selected near Anand in Kaira District in Gujarat.

Thirteen villages were selected near Jalgaon and Dhulia in Khandesh.

Six villages were selected near Pandharpur in the Deccan.

Ten villages were selected in Bijapur and Belgaum Districts in the Southern Division.

Breed and number of Animals tested.

In all 1,037 animals of three chief breeds were tested :—

374 animals of Surati breed of the buffaloes were tested in Gujarat.

309 animals of Malvi breed of the buffalo were tested in Khandesh.

286 animals of Pandharpuri breed were tested at Pandharpur and Bijapur.

68 animals of Jowari (i.e. local) breed were tested in Belgaum District.

Results of the test.

1. The cultivator in Gujarat kept a greater proportion of better producers, as 70 per cent. of the Surati animals tested, yielded 3,500 lbs. of milk and above per lactation, whilst 10 per cent. of the total exceeded the yield of 5,500 lbs. per lactation.

2. In Khandesh, 49 per cent. of the Malvi animals tested, yielded 3,500 lbs. and above per lactation, whilst only 8 per cent. of the total exceeded the yield of 5,500 lbs. per lactation.

3. In Pandharpur and Bijapur centres only 18 per cent. of the Pandharpuri animals tested gave 3,500 lbs. of milk and above per lactation, whilst only 1 per cent. of the total tested, yielded more than 5,500 lbs. of milk per lactation. It may be observed that these animals were kept by Gavalis in these centres. Animals kept by the cultivator, being much poorer, were not selected for this work.

4. In Belgaum centre only 15 per cent. of the Jowari animals tested, yielded 3,500 lbs. of milk and above per lactation, whilst only 1·5 per cent. of the total yielded more than 5,500 lbs. per lactation.

This shows that about 30 per cent. of the cultivators in Gujarat keep animals that are boarders and profitless. Whilst in Khandesh about 50 per cent. of the people keep animals that make losses. But in the South Deccan and the Southern Division more than 70 per cent. of the people keep unprofitable animals.

This at once shows that we must improve the different breeds of the buffalo and the Department has selected 24 bull-calves of different breeds from the animals tested under the Scheme for rearing and giving out as breeding bulls in different tracts. Besides this, 27 good bull calves and a bull have been selected from the Agricultural College Dairy and private cultivators known to keep milk records of heir animals.

It may be observed here that the cultivator very rarely rears a bull-calf. In fact, the bull-calves of the best milkers are starved to death in the very first month of their life to save milk. Whatever breeding bulls are available in the country side are those that survive the starvation and these come invariably from the poor milkers. In view of this difficulty of obtaining good breeding bulls, the owners of heavy milkers were induced to rear bull-calves by offering them good price at weaning and thus the Department of Agriculture has obtained 52 good bull-calves for future breeding purposes as under :—

37 Surati bull-calves have been purchased at an average price of Rs. 20 each at an age of about one year.

6 Malvi bull-calves have been purchased at an age of about 1 year at an average price of Rs. 20 each.

6 Pandharpuri bull-calves have been purchased at an age of one year and a half at an average price of Rs. 26 each.

2 Jowari (Local) bull-calves have been purchased at an age of about one year at an average price of Rs. 16 each.

1 Breeding Bull was purchased from the College Dairy.

The records of the dams of the bull-calves selected show that the yield per lactation has been over 4,000 lbs. of milk, whilst couple of bulls came from the dams that have yielded about 7,000 lbs. of milk per lactation.

Disposal of Milk.

The milk near cities and towns is disposed off as fresh milk for consumption as it is more profitable to do so. Besides in Pandharpur the Gavlis sell curds and country butter.

In the villages, away from cities or towns, the whole milk is soured and churned into butter for making ghee. This process is laborious and wasteful of butter-fat in butter-milk. Therefore the use of Cream separator and churning of cream to make butter and ghee were demonstrated at various centres except in Gujarat, where milk is sold to the Creamries for separation and butter making.

The making of butter from cream showed an increased yield of butter by 10·7 per cent. over the country method of making butter from the whole milk. Whilst the yield of ghee obtained by churning cream was higher by 16·8 per cent. than that obtained from churning the whole milk. Besides the owner has the separated milk left with him.

Attempts are being made to persuade people to make use of this separated milk as human food in the form of cheese cakes, curd and butter-milk. However, the prejudice against the use of separated milk for food is very strong as the cultivator prefers the butter-milk. It may

be observed that owing to warm conditions and the keen demand that exists for butter-milk amongst the people, the cultivator does not take to separation even though he is likely to gain about 16 per cent. in his ghee yield.

This was closed at the end of March 1937, as the Government of India discontinued the grant allotted to this work. However the work being very important it is gratifying to note that the Government of Bombay have allotted funds to provide for Kamgars and the contingent grants necessary to continue this work. The supervision work has been added to this normal heavy work of the present existing Divisional Inspector of Cattle Breeding though it may mean less efficient supervision. It is hoped that the Government will provide for an additional Divisional Inspector.

SCHEME No. 2—*Improvement of Poultry in villages.*

The Scheme is for replacing country cocks by pure bred ones to give the village poultry keeper a high yielding cross bred. Since the starting of the work, villages have received the benefit from this Scheme. The details of cocks put out in each District is given as follows :—

District.	Number and breed of cocks put out departmentally.	Number and breed of cocks put out from the funds placed by the Collectors.	Total number of cocks put out.
Poona	31 White Leghorns ..	86 White Leghorns ..	127
		10 Rhode Island Red ..	
Sholapur ..	6 Wyandottes ..	....	16
	10 Australorps ..	....	
Satara	82 White Leghorns ..	42 White Leghorns ..	159
	15 Australorps ..	....	
	20 Rhode Island Reds ..	....	
Ahmednagar ..	20 White Leghorns ..	....	20
Kolaba	15 Rhode Island Reds ..	16 Rhode Island Reds ..	31
Belgaum ..	20 White Leghorns ..	5 White Leghorns ..	25
East Khandesh ..	....	22 Rhode Island Reds ..	39
		17 White Leghorns ..	
Total ..	219	198	417

There is no doubt that the cocks coming from the highly specialised Government farm or any other pedigreeded farms have had to stand crude treatment in village environment. Besides, in many places there was

an outbreak of deadly disease called "Ranikhet" which swept away both the pure and country birds. Yet we have a sufficient number of cross birds left. The experience gained has been a very useful one. It is essential to concentrate the work in one centre in a District to get useful results and secondly there must be some one to educate and guide the village poultry keeper from day to day. With this view a note has been prepared on how to organise the work in each District and has been sent to all the Collectors who have been planning this work from the Village Uplift Funds.

SCHEME NO. 3—*Poultry Premiums to Farmers.*

Three more premiums were granted this year.

1. Rao Saheb V. V. Shirgaonkar in Belgaum was given a housing premium of Rs. 100. His farm supplied 40 settings of eggs, and 54 pure bred birds to the cultivators in the villages.

2. Mr. B. L. Patil of Kanabargi was given an egg and fowl premium. His farm has supplied 42 dozen setting eggs and 51 birds to the cultivators.

3. Mr. I. P. Naik of Uppin-Betegeri in Dharwar District has been recently given an egg and fowl premium.

4. Mr. Mayanuddin Moulavi of Pandharpur was granted housing premium. Unfortunately his Rhode Island Red flock was swept away by Ranikhet disease and he has made new start with White Leghorn.

SCHEME NO. 4—*Co-operative egg collecting, grading and marketing.*

The Poultry Kamgar stationed at Yellur egg collecting and Sale Society graded and candled 34,775 eggs this year before sending them to Bombay and Poona. As the size of eggs handled, was not satisfactory for attracting customers who pay high rates for size, the Society had to depend on egg merchants and Commission agents for selling their eggs. The Society was paying a flat rate for eggs, the price being fixed at four annas per dozen, while these eggs were sold at Bombay by egg merchants at current prices fixed according to the left-overs of the previous day and the number of packages arriving in a day. In these transactions the Society worked at a loss although the producer gained by the average flat rate. The grant for this work was stopped by the Imperial Government and it was not thought advisable to continue the scheme unless large tracts were developed to produce big sized eggs. As a matter of fact unless any large tract produces big sized eggs for a sufficiently long period and establishes reputation by selling graded eggs of better size, market will not take any notice of it for giving better price. It is therefore suggested that grading should be practised whether better price is paid or not to establish a good name for eggs.

Palghar Dairy District Scheme.

Though the Scheme is attracting attention of many dairymen and applications for land near Palghar are pouring in, unfortunately very little actual progress has been made. The Government have set apart an area of 2,072 acres of land for the Scheme. Out of this 1,054 acres have been released. Mr. M. M. Killedar one of the leading producer of the milk in Bombay stables was granted about 500 acres of land and though he took possession of the land in November, 1935, he has not worked up the Scheme as expected and even the lease has not been so good. The other recipient of 537 acres of land is Mr. Haji Moosa Umarji Bharucha who has promised to work up the Scheme in 18 months of the date of possession of land and it is hoped he will lead in this work as he is very earnest. As soon as a Scheme starts working satisfactorily there will be no difficulty in starting other concerns.

The Infants and Public Milk Supply Company, Limited, Bombay.

Palghar Dairy Farm.—The farm has been progressing fairly well under the management of Mr. P. P. Mistry.

The total number of animals in the institution during the year comes to 438 as against 416 of last year. Out of the 16 dry buffaloes purchased from Bombay stables ten aborted after 7 months' pregnancy. This has been an unfavourable factor. The Company has invested an additional capital of Rs. 13,702 for stables, fencing, and clearing. The Company produced and despatched 477,902 lbs. of milk to Bombay during the year.

The Company however has yet to go a long way towards proper organisation of the work. If they are to exploit the area fully they must have silo pits and grow more fodder crops by putting more land under plough. This will help to feed the cattle better than they do now. Besides, the Company should buy good animals and keep them well and rear a large number of animals of their own from the selected best animals. This will increase the production per animal and will give better financial results in course of time. Better feeding and rearing of young stock are allied together and it is hoped the Company will pay proper attention to these aspects of the management in future.

Bombay Gowrakshak Mandali.

The Kandivali Farm with its sub-station at Betegaon has made a very good progress during the year under report. The Farm was under the management of Mr. Goda, B.Ag.

The Farm was visited by Dr. N. C. Wright.

Crops.—A regular Scheme for supply of green fodder has been taken up at Betegaon but out of the total 60 acres of cultivable land, 15 acres were under irrigation. One additional well has been dug and this would bring another 5 acres under irrigation.

Livestock.—The Mandali has now 119 pure Gir cattle at Kandivali and 147 at Betegaon; average number of Cows in milch is 46 and dry cows 28·6. There were 58 births and 22 deaths this year. The herd of cows is in very good condition and shows high standard of breeding and up-keep. During the year 178,712 lbs. of milk was produced as against 144,611 lbs. of the last year.

Bull.—Five bulls were given out for breeding this year and six are ready to go out.

The Farm is developing into a fine centre for Gir breed and it is hoped that in future the Mandali would develop the farm to the fullest capacity and grow green fodder at Kandivali for the herd instead of bringing green fodder from Betegaon.

This year the Mandali has been of great help in saving the pure bred stock of Kankrej in North Gujarat, where the breeders were hard hit by the scarcity of fodder. The Mandali are to be congratulated for this useful work. With the funds granted by them 180,500 lbs. of grass supplied to save 3,023 animals.

Scheme for Research in Poultry Husbandry financed by the Imperial Council of Agricultural Research.—The Imperial Council of Agricultural Research have sanctioned a sum of Rs. 43,736 for research Scheme in Poultry Breeding for 5 years from the 1st of October 1936 to 30th November 1941, in the following centres of the Bombay Presidency:—

(1) Kirkee Centre in the Poona District under the Live Stock Expert to Government, Bombay Presidency, Poona.

(2) Vadala Centre in the Ahmednagar District under Rev. R. W. Fairbank, American Marathi Mission.

(3) Ankleshwar Centre in the Broach District under Mr. I. W. Moomaw, Principal, Vocational Training School, Ankleshwar.

The above three centres are under the supervision of the Live Stock Expert to Government, Bombay Presidency, Poona.

The work of the above three centres was started on the first of October, 1936. An amount of Rs. 18,680 was sanctioned by the Imperial Council of Agricultural Research during the financial year 1936-37 for the working of the three centres.

The following breeds of fowls both European and indigenous were kept in each of the three centres as shown against them for studying the genetic behaviour and fixing up suitable type of birds for the country :—

(1) White Leghorns (2) Rhode Island Reds (3) Black Minorcas (4) Light Sussex *Duck Class.* (1) Indian Runners (2) Khaki Cambell	Kirkee Centre.
(1) White Leghorns (2) Black Minorcas	Vadala Centre.
(1) White Leghorns (2) Rhode Island Reds (3) Naked Necks (Indigenous Breed).	Ankleshwar Centre.

The indigenous breeds, viz., Chittagong and Naked Necks for Kirkee and Vadala Centres will be purchased in the next year as they could not be purchased on account of virulent disease prevalent in the tracts from where they are to be obtained.

Progress of work was partly hindered for want of proper housing and partly on account of outbreak of contagious diseases in Vadala and Ankleshwar Centres. Building of poultry houses and runs was started late in December, 1936, and could not be finished in time. Trapnesting work for testing egg laying capacity is attended in almost all three centres. The selection of birds for breeding is done on the basis of trapnesting records. Feeding experiments were conducted in all the centres but the results are yet to be completed.

It is worth noting that both the breeds of Ducks, viz., Indian Runner and Khaki Cambells did very well in the Kirkee Centre. Hatching ducklings was very successful. The ducklings in the Kirkee Centre grew wonderfully well. There was very little mortality in duck class.

The Sheep Breeding Research Scheme sanctioned by the Imperial Council of Agricultural Research is to come into operation during the year as soon as the Government of Bombay makes their share of fund available.

APPENDIX I.

Effect of bull on Early Maturity.

(Kankrej herd at Chharodi.)

Serial No.	Dams. Name.	Dams. Age at first calving. Y.	Dams. Age at first calving. M.	Daughters. Name.	Daughters. Sire.	Daughters. Age at first calving. Y.	Daughters. Age at first calving. M.
1	Kesar ..	4	2	Kesar 2–33 ..	Waghen 12–28	3	11¾
2	Dhordi ..	4	1½	Dhordi 8–33 ..	Do. ..	3	9½
3	Samli ..	4	1¼	Samli 19–32 ..	Do. ..	4	4
	Total ..	12	4¾		Total ..	12	1¼
	Average ..	4	1½		Average ..	4	1½
4	Boked ..	5	0	Boked 21–32 ..	Padal 8–29 ..	3	5½
5	Chokhli ..	4	1¼	Chokhli 4–33 ..	Do. ..	3	3½
	Total ..	9	1¼		Total ..	6	9
	Average ..	4	6½		Average ..	3	4½
6	Nasal ..	4	½	Nasal 11–32 ..	Chandlee 20–28	4	0
7	Meghan ..	4	¼	Meghan 16–32 ..	Do. ..	3	9½
	Total ..	8	¾		Total ..	7	9½
	Average ..	4	¼		Average ..	3	10¾

APPENDIX II.

Statement showing the milk and milk products, their production and disposal at the Northcote Cattle Farm, Chharodi, during the year 1936-37.

Items.	Quality.	Value.	Remarks.
	Lbs. oz.	Rs. a. p.	
Milk produced ..	134,426 0	....	
Milk sold	19,348 8	604 10 3	At 0-0-6 per 1 lb.
Milk and Colostrum fed.	2,467 12	77 1 11	Do.
Milk used for test ..	569 12	17 12 10	Do.
Separated milk produced	101,689 8	264 13 1	At 24 lbs. per 1 anna.
Separated milk fed ..	101,689 8	264 13 1	Do.
Cream produced ..	7,850 8	....	
Cream churned ..	7,840 0	....	
Ghee produced ..	3,660 8	....	
Ghee sold	3,599 8	2,755 13 11	At 0-12-3 per 1 lb.
Ghee fed	33 8	25 10 5	Do.

APPENDIX III.

Statement showing Regularity in calving in foundation stock, F_1, F_2 *and* F_3 *Generations during the year* 1936-37.

(Kankrej herd at Chharodi.)

Generations.	Number of cases.	Age at first calving.	Interval between calvings. I and II.	II and III.	III and IV.	IV and V.
		Y. M.	Y. M.	Y. M.	Y. M.	Y. M.
Originals	103	5 7¼	1 10¼	1 8½	1 7½	1 5¾
F_1 First Generation ..	161	4 4¾	1 6½	1 4¾	1 2½	1 2½
F_2 Second Generation ..	64	4 0	1 4½	1 4	1 1½	1 1¾
F_3 Third Generation ..	7	3 9	1 5	1 0¾	0 10¾	1 1¾

Programme of Work under the Live Stock Expert to Government, Bombay Presidency, Poona, for the year 1936-1937.

I. *Breeding Farms.*—The policy of breeding up reliable pure strain of cattle will continue, keeping in mind the production of more economical animal, which will mature early and calve more regularly. The breeding of a good dual and draught purpose animal on the above lines will continue at Chharodi and Bankapur farm respectively.

II. Nutritional investigations and experiments will be conducted on various food stuffs as far as finances will permit.

III. (*a*) Propaganda in connection with the spreading of the use and benefits of Pedigree bulls will continue together with teaching of better methods of care.

(*b*) The herd Register of all pure cattle of each breed will continue. Thus in a few years we shall have all the pure types of cattle pedigree as we shall know the dams and sires. This also would help us in tracing the progeny of premium bulls. This method would be of great advantage to breeders as they can with the certificate supplied prove their animals to be well bred.

IV. The Co-operation with the Kandivali Gowrakshak Mandali will continue in breeding, raising and spreading Gir breed in towns, together with the fine illustration of what can be done if the people are so inclined with Panjrapoles to make them useful institutions to the Country instead of the burden they are at present.

V. *Poultry.*—(*a*) The work of breeding suitable foreign breeds of poultry will continue on the Government Central Poultry Farm, Kirkee.

(*b*) Investigations regarding incubation, control of diseases and feeding of poultry will continue.

(*c*) To help and advise poultry breeders as far as it is possible.

(*d*) Experiments in the egg laying capacity of different breeds in single testing pens will continue.

VI. *Sheep Improvement Work.*—It is hoped that the sheep breeding scheme will be financed soon and that this very urgent work will be taken in hand. The land for this work has been taken over from the Forest Department and silage and hay is to be made for sheep.

VII. The Scheme for Research in Poultry Husbandry financed by the Imperial Council of Agricultural Research will be continued during the year.

VIII. *Buffaloes.*—The work will be continued during the year as a part of the activities of this Section.

IX. *Palghar Dairy District Scheme.*—It is hoped that more land would be taken up by farms this year.

X. *Village Improvement Scheme.*—The Buffalo Improvement Work and egg marketing Section has been dropped. The following Sections under these will be continued :—

(*a*) Village Poultry Improvement on intensive scale.

(*b*) Poultry Station Scheme.

APPENDIX M.

Summary of Work done under the Agricultural Engineer to Government, Bombay Presidency, Poona, for the year 1936-37.

Mr. C. G. Paranjpe held charge of the section during the year under report.

The control of the Mechanical Assistants in the three divisions, viz., Gujrath, Southern Division and the South Central Division, was transferred to this office in accordance to G.R., R.D., No. 10077/28, dated the 9th February 1937, along with the mechanical work in the divisions from 1st April 1937 which added 4 more members to the staff as under :—

Three Mechanical Assistants at Surat, Poona and Dharwar,

One driver under the Mechanical Assistant, Poona.

Owing to the retirement of Mr. Rahater, Mechanical Assistant, Poona, Mr. R. P. Patel, B.E. (Mech.), has been appointed to the post of the Mechanical Assistant, Poona, from 1st May 1937. The premature and sudden death of Mr. G. R. Kulkarni, on 13th October 1936 has been a great loss to the section. He was a very able and efficient store-keeper and a mention of his able and meritorious services will not be out of place as a sense of appreciation of the valuable services rendered by him till his death. Mr. C. N. Pandya from the office of the Director of Agriculture, has taken up his place as a store-keeper with effect from 7th November 1936.

The work in general has been considerably increased from every direction, owing to the sale of boring machines, numerous additional works and greater demand for the loan of boring machines and pumping plants on hire. The construction of a cattle dip and erection of a new pumping plant at Chharodi Cattle Breeding Farm, construction of the non-graduate quarters and the office at the Cereal Breeding Station, Niphad, erection of new machinery and repairs to the old at the Arbhavi Farm, erection of poultry runs and extension of the incubator house at the Government Central Poultry Farm, Kirkee, erection of 3 pumping plants at Mundhava for private owners, erection of a bore-hole pump at Kondhva Leper Asylum, extension of the glass house at Sholapur Dry Farm, construction of two Lysemeters and glass roof for the transperometer shed at the Sugarcane Research Station, Padegaon, working of the Nangaon Pumping Plant and the mechanical help rendered to the Deputy Director of Agriculture, North Central Division, Nasik, in machinery matters in the absence of a Mechanical Assistant, form part of the important activities of this section for the year under report.

Advice and Help.

Enquiries for advice in agricultural machinery are steadily on the increase as the total number during the year under report amounts to

244 against 189 of the last year. Out of these 66 are for pumping plants, 10 for tractors, 6 for cane-crushers, 1 for wind mill, 3 for chaff-cutters, 2 for gins, 3 for winnowing and threshing machines, 122 for boring and 31 on miscellaneous subjects. There were 24 applications for admission to the Oil Engine Class, out of which 13 students attended the class and received training in the oil engine driving. The number of drawings prepared in the year, including sketches, amounts to 82 and the number of estimates for machinery and structural works amounts to 14. The number of sites surveyed is only 6 while mechanical assistance was rendered to 9 people in connection with erection of pumping plants and repairs to machinery in cases of breakdowns.

Since the transfer of control of the Mechanical Assistants to this section from 1st April 1937 they have surveyed 6 sites, inspected 59 plants, undertook erection of machinery at 4 places and conducted repairs to 5 plants.

Research on Implements and Machines.

This year more attention was given to conducting exhaustive tests with the implements designed and demonstrating them at as many places as possible, partly to obtain cultivators' views on their working and partly to give them sufficient publicity. Several machines had to be, therefore, manufactured at the shops to achieve this object and the work was confined mainly to the following :—

(1) Seed drills for cotton, jowar and wheat,

(2) Winnowing fans,

(3) Ball-bearing cart wheels,

(4) Soil scooper,

(5) Groundnut diggers.

In addition to preliminary trials at Poona the work was concentrated in North Central Division and Southern Division and a summary giving the progress done on each is given below in brief.

Seed Drills.—The improved automatic drills can be divided into 3 main classes, viz., (1) the special wheat drill for Jalgaon tract, (2) the light weight cotton drill and (3) the general purpose all steel drill. The light weight drills are nothing but a modification of the local drills fitted with the automatic sowing and lifting attachments. They have been found to be much lighter in draft owing to their less weight when compared with the all steel drill. Two light weight cotton drills were made for the North Central Division and supplied to Jalgaon Farm for exhaustive tests in addition to two improved sets of automatic lifting and drilling attachments for use on wheat drills. Two light weight cotton drills are also supplied to Southern Division for trials at Gadag

and Dharwar respectively. The wheat drills were demonstrated by the Superintendent, Jalgaon Farm, at the farm and also at 14 different places, in cultivators' fields and in all 22 acres were sown with them. The cotton drills were also tried at the farm with fairly satisfactory results. The District Agricultural Overseer, Dharwar, has sown 55 acres with the drill sent to him, at different places and found it to be working satisfactorily when the soil conditions were suitable.

The all steel drill kept for tests at the Dry Farm, Sholapur, was fitted with a chain drive in place of the rope as the latter was found to slip badly. The chain drive has shown distinct advantage over the rope drive resulting in more uniform seed rate.

Winnowing Fans.—Further improvements in the design of the chain driven winnowing fans have been carried out with a view to make them more easy to work and also fool-proof. The W. I. frame is now replaced with C. I. brackets with a view to get better alignment and majority of the bearings are now replaced with ball-bearings. Two such new fans have been made and supplied to the North Central Division for exhaustive tests. One of them is sent to Sindkheda and the other to the Inspector of Agriculture, Dhulia. The fans specially kept at Jalgaon were exhibited at nine different villages on winnowing jowar, bajri, wheat, coriander and other seeds and cultivators of all these places have greatly appreciated their performance and utility. The fan sent to Sindkheda has also given good results. With a view to bring down the costs to a minimum, further improvements in the design are in progress and it is hoped that some useful data as regards their performance can be given in the next year's report.

Ball-bearing Carts.—Further improvements in the method of fixing the ball bearings in the local bullock cart wheels, have been effected from the experience gained so far, with a view to make the introduction of ball-bearings as cheap and simple as possible. Two such sets of wheels have been prepared during the year under report, one for the Superintendent, Dharwar Farm, and the other for Principal Gokhale of the College of Agriculture, Poona. The set of wheels made previously for the Dharwar Farm was supplied to the Agricultural School, Nasik, as the diameter of the wheels was found to be much smaller than the local wheels. It is over eighteen months since the cart at the Agricultural College Dairy is fitted with ball-bearings and it is found on occasional inspection that the bearings have stood exceedingly well although the cart is in constant use. These wheels are getting popular day by day and the demand for 10 more sets indicates that their advantage in reducing the draft is being appreciated by the people gradually. It appears to be essential to test these wheels on very rough roads in order to prove their utility and efforts in that connection are in progress.

Soil Scooper.—The scooper kept for trials at the Sholapur Dry Farm has done nice work as usual but the one sent to Bijapur Dry Farm, did not work so very satisfactorily on account of peculiar soil condition.

Certain changes had to be, therefore, effected in the design immediately and it is found that they gave much encouraging results although the soil conditions then were not found to be satisfactory, owing to want of rain in August last. The machine is going to be tried in the ensuing season and results will be given in the next year's report. Experiments with the Scoopers in the North Central Division have shown that scooping is not very useful for the conditions in that division where *kharif* rains and *kharif* crops are of more importance than *rabi* rains in which scooping is of greater advantage. Further experiments with the machine will, therefore, be concentrated in dry tracts only.

Groundnut Digger.—The digger tried at Gadag and Mundergi Peta last year was brought to Poona for effecting the necessary improvements and it was again sent back to Gadag for further tests. There was further a demand for a digger from three talukas of Belgaum District. Two more diggers had to be therefore made at the shops and supplied for exhaustive tests. They were demonstrated at the following places :—

Karad in Satara District,
Gokak and in the neighbourhood,
Hukeri and in the neighbourhood,
Gadag and Mundergi Peta.

The trials at all these places have proved the utility of the machine and cultivators have greatly appreciated their performance in comparison with the local method of harvesting groundnut. The machine requires further improvements and trials with a view to remove certain drawbacks and attempts in that connection are in progress.

In addition to the above two small ridging implements, one of wood and the other of steel, have been made for conducting experiments in Gujrat and their results will be given in the next year's report.

Erection of machinery and special works.

The section was kept excessively busy throughout the year under report on account of several erections of new machinery and special constructions. Some of the constructions such as the cattle dip at Chharodi Farm and the houses and runs erected at the Poultry Farm, were of entirely different nature and absorbed a good deal of time both in design and construction. The following is a short summary of the erections made and special constructions undertaken :—

Place.	Brief description of work.
Arbhavi Farm ..	(*a*) Erection of a 19 BHP Blackstone crude oil engine with 2½" Gwynne's Centrifugal Pump, Atlas power chaff-cutter and countershaft for driving the 5 roller Cuba Mill, the centrifugal pump, the juice pump and the chaff-cutter.

	(*b*) Construction and erection of a steel tower and putting a G. I. discharge tank over it and connecting it to the down-take pipe and the delivery pipe of the pump.
	(*c*) Erection of the engine house to suit the new engine, constructing the belt trenches and making a new floor.
	(*d*) Repairs to the old 6″ pipe line 2,200 feet in length including relaying of the 1,200 feet of C. I. pipes.
Central Poultry Station, Kirkee.	(*a*) Erection of 24 small poultry runs each 17′ × 10′ × 7′ high and providing them with 24 portable houses.
	(*b*) Erection of 6 big double poultry runs, (two 30′ × 80′ × 7′ and four 45′ × 80′ × 7′) constructing in them 2 flockpens 10′ × 20′, 2 breeding pens 10′ × 15′ and 2 duck houses 10′ × 20′ with different material for experimental purpose.
	(*c*) Construction of a duck pond 12′ × 12′ × 2′–6″.
	(*d*) Construction of an experimental run 80′ × 10′.
	(*e*) Extension to the Incubator house and making it underground.
Chharodi Farm ..	(*a*) Construction of a reinforced cement concrete cattle dip 50′ long, 4′ wide and 9′ deep, below ground, complete with 2′ brick coping walls on either side and necessary pipe fencing for its entire length including the crush at the entrance.
	(*b*) Erection of a new pumping plant, comprising a 9 BHP Hindustan Crude Oil Engine and 2½″ Gwynne's Centrifugal Pump with pipes and connections.
	(*c*) Removal of the old plant and fixing it on the well near the bungalow.
	(*d*) Cleaning of the bore-hole in the above well.
Niphad Farm	(*a*) Construction of the Non-graduate quarters and the office.

Dry Farming Research Station, Sholapur.	Extension of the Plant House by 10'.
Sugarcane Research Station, Padegaon.	Construction of the two Lysemeters and glass roof for the Transpirometer shed.
Workshops of the Agricultural Engineer to Government, Poona.	Erection of the steel store shed 70' × 22' × 12'.
Gilligan Cattle Breeding Farm, Jalgaon.	Erection of machinery including the following :— 10 BHP Ruston crude oil engine and 3" Worthington Simpson Centrifugal Pump for irrigation with 300' of piping. 2" Plunger pump with pipes and connections, for water supply. 2" Countershaft. Atlas Power Chaff-cutter Grinding Mill.
Mundhava	Erection of 3 pumping plants on wells for Mr. Pingale as under :— 7 BHP Ruston crude oil engine and 3" Ruston centrifugal pump. 12 BHP Corting crude oil engine and 4" Centrifugal pump on temporary girder frame. 12 BHP Corting crude oil engine and 4" Centrifugal pump on proper concrete foundation.
Leper Asylum, Kondhava ..	Sinking of a 4" tube well and erecting a 4" Tube well power pump on it with a 7 BHP Hindustan crude oil engine and carrying the water to a length of 250 feet.
Nangaon	Working the pumping plant on river Bhima at Nangaon District, Poona, consisting of 37 BHP Crossley Gas engine and 12" Boving Centrifugal pump for a period of 4 months from 29th October 1936 to 28th February 1937 for the villagers of the place for growing fodder crop. The total area brought under irrigation amounts to 250 acres approximately. In all three waterings were given to the entire area and the cost of water per acre per watering came to Rs. 2-10-3.

Miscellaneous Works.

The following is a brief summary of the important miscellaneous works undertaken by the section during the year under report :—

1. Repairs to bore-hole hand pump at Kondhava Leper Asylum.
2. Repairs to Nangaon Pumping Plant.
3. Fixing curtains on the Glass House with necessary winding gear.
4. Repairs to pump at Kharadi.
5. Repairs to bullock power cane crusher at the Agricultural College Farm, Poona.
6. Repairs to sprayers of the Plant Pathologist to Government, Poona.
7. Repairs to parts belonging to the Cold Storage Plant at the Ganeshkhind Fruit Experiment Research Station, Kirkee.
8. Repairs to machinery at Kopergaon Farm.
9. Repairs to bore-hole pump at the Rice Breeding Station, Karajat.
10. Repairs to bore-hole pump at the Dry Farming Station, Bijapur.
11. Repairs to bullock gear of the Agricultural College Farm, Poona.
12. Repairs to Electric Centrifuge of the Agricultural Chemist to Government, B. P., Poona.
13. Repairs to Gas Plant at the Agricultural College, Poona.
14. Repairs to pipe line at Poultry Farm, Kirkee.
15. Repairs to cane crusher at Arbhavi Farm.
16. Testing of 6 BHP Wizard engine and $2\frac{1}{2}''$ Pulsometer pump on the Experimental Well under identical conditions before same were sent to Belgaum for the Show work.
17. Building steel racks for the new store shed.
18. Construction of two portable poultry houses for the Live Stock Expert to Government, B. P., Poona, one built of Heraklith sheets and the other with Asbestos Cement sheets.

Hire and sale of Boring Machines.

The demand for the loan of boring machines on hire was fairly heavy owing to scanty rains of the last year and consequently 15 machines were given on hire to different people as detailed below :—

Name.	Number.	Description.
Mr. G. C. Govande of Poona ..	5	2 Calyx and 3 Musto.
The Consolidated Pneumatic Tool Co., Ltd., Bombay.	1	Calyx.
Mr. C. E. Mulroney, Poona ..	1	Do.
Mr. K. G. Deo, Poona	1	Do.
The Manager, Belvandi Sugar Farm ..	1	Musto.
The Manager, Maharashtra Sugar Mills, Belapur Road.	1	Do.
Messrs. Manahar Brothers, Bombay ..	1	Calyx.
Mr. V. S. Naik of Devgiri, District Dharwar.	1	Do.
Mr. S. K. Gavand of Thana ..	1	Sludger.
The Manager, Bankapur Cattle Breeding Farm.	1	Musto.
The Chief Investigator, Dry Farming Research Scheme, Sholapur.	1	Set of boring tools with a tripod.
Total ..	15	

Mr. Govande has in all finished 12 bores with a total footage of 1,143 feet out of which 7 were successful. The total quantity of water tapped with these bores amounts to 10,000 gallons per hour.

The Belvandi Farm made in all 5 bores out of which 2 only were successful. The boring made by Mr. Mulroney was also successful but those made at Sholapur and Bankapur Farms were entire failures. The bore made by Mr. Deo was also a failure. The details of other bores are not yet received.

The total number of boring machines sold during the year under report was 2 of which one G-31 Calyx drill was sold to the Agri-Horti Officer, Dharampur State, and one 4″ Musto Patent power boring machine to the Chairman, Umbergaon Implement and Machinery Society, Umbergaon, District Thana.

Hire of Pumping Plants.

The demand for pumps and pumping plants on hire was fairly great and the following gives details of the plants hired out :—

1. 3 BHP Blackstone engine and 2½″ Gwynnes Centrifugal Pump with pipes and connections to contractor Mr. Darabarasingh, Poona, for emptying water from foundation pits in a bridge construction.
2. 2½″ Pulsometer Centrifugal Pump to Mr. V. M. Purandare of Shelarwadi for irrigation.
3. 2½″ Fire portable pump to Mr. N. G. Pawar of Poona for his contract work.
4. Bore-hole power pump to the Chairman, Pilgrim Committee, Saundatti, Saundatti Yellamma Municipality, for water supply.
5. 6″ × 5″ Sulzer Centrifugal Pump to Mr. S. V. Sakhadev of Belgaum for irrigation.
6. 6-7 BHP Wizard engine and 2½″ Pulsometer "K" type pump with pipes and connections to the Karnatak Agricultural Show Committee, Belgaum, for the ensuing Agricultural Show at Belgaum.
7. 2½″ Two cylinder plunger force pump to Mr. L. D. Divikar of Kadethan for emptying his well.
8. 14 BHP Blackstone engine and 3″ Tangye centrifugal pump with pipes and connections to Mr. L. D. Divikar of Kadethan for emptying his well and building it with masonry.
9. 3″ × 4″ Centrifugal Ruston pump with piping to Mr. D. L. Paranjpe of Poona for irrigation.
10. 3″ Fire portable pump to Mr. Kanji Karsandas of Poona.
11. 3″ Kirloskar Centrifugal Pump with girder frame to Mr. G. H. Dharawade of Mundhawa for irrigation.
12. 2½″ Ruston Centrifugal pump with piping, etc. to Mr. G. J. Shitole of Patas for irrigation.
13. 2½″ "K" type Pulsometer Centrifugal pump to Mr. K. L. Khartude of Patas for irrigation.

Defibration of Cotton Seed.

The operations for the season were commenced in March 1937 and ended in May 1937. In order to test the DeSegundo defibrating machine on a large scale, the problem to be solved first was to eliminate the feeding of the machine by hand as it required an additional man and affected

the out-turn of the machine considerably. It was discovered that the Maker's arrangement of driving the feed hopper was found to be unsuitable for different degrees of defibration and in order to prevent occasional choking of the machine, the hopper was arranged to be run from a second motion shaft at different speeds independent of the speed of the machine. This arrangement not only solved the difficulty but increased the out-turn of the machine. Only BD.8 cotton was treated in the machine and although it gave better percentage of germination than the local seed tried last year yet the results cannot be considered to be so good for advocating defibration. Experiments with the oil tests in an expeller revealed that the raw seed gave out 12·0 per cent. of extraction against 11·8 per cent. with the defibrated seed as the latter was found to lose some oil during the process of defibration. The disposal of oil, cake and fuzz has been found to be a great problem as there is no demand for any of them. Since the oil test has proved that the Oil Expeller can very successfully deal with raw seed, defibration of cotton seed appears to be of very little advantage especially when the percentage of germination with the defibrated seed is not to the mark. It is, therefore, a matter for consideration whether the experiments should be conducted any further.

General.

The staff in general has done exceedingly well in spite of the excessive pressure of work. The financial position continues to be satisfactory owing to the sale of boring machines, sale of tools and spares and a considerable demand for boring machines and pumping plants on hire. The total receipts amount to Rs. 26,286-6-6 as detailed below :—

	Rs.	a.	p.
Sale of boring machines	16,544	11	0
Sale of boring tools and spares	680	4	3
Sale of other material	626	10	10
Hire of boring machines	7,798	7	11
Hire of pumping plants	162	3	5
Hire of other material	429	1	1
Oil engine class fees from students outside Bombay Presidency and from State Jurisdiction	45	0	0
	26,286	6	6

The above receipts are calculated from July 1936 to June 1937 and they do not include the cost of material supplied and repairs undertaken for Departmental Institutions which approximately amount to Rs. 120.

C. G. PARANJPE,
Agricultural Engineer to Government,
Bombay Presidency, Poona.

Programme of work under the Agricultural Engineer to Government, Bombay Presidency, Poona, for the year 1937-38.

1. Research on Implements, including modifications and	(*a*) Modifications and tests with wheat and cotton seed drills, Winnowing fans, Groundnut digger, Soil scooper, Ball bearing cart wheels, etc., etc.
	(*b*) Design and manufacture of a Bunding Implement for use with Tractor.
	(*c*) Tests with a ridging implement.
2. Famine Pumping	(*a*) Inspection of pumping sites on big rivers in the Presidency for growing fodder.
	(*b*) Keeping of 7 Famine Pumping Sets in readiness.
3. Advice and help	(*a*) Training of cultivator students in driving of engines and pumps.
	(*b*) Periodical inspection of agricultural machinery.
	(*c*) Advice to cultivators in agricultural machinery.
	(*d*) Advice to Divisional Officers in machinery matters.
	(*e*) Survey of sites and supply of drawings and estimates.
	(*f*) Erections and repairs of machinery for private individuals through the Mechanical Assistants.
4. Higher Technical Assistance.	(*a*) Help to Divisional and other Departmental Officers in case of repairs and breakdowns.
	(*b*) Erection of water lifts on the Patalganga, Kundalika and Ulhas rivers in connection with the Village Improvement Scheme.
	(*c*) Erections of Departmental machines and special constructions as under: Erection of a power gin with engine and chaff-cutter at Bhadgaon Farm.

5. Special works	(*a*) Construction of a Glass House for the Plant Pathologist to Government, Poona.
	(*b*) Construction of a Dutch Barn and Servants' quarters at Cereal Breeding Station, Niphad.
	(*c*) Work in connection with the Karnatak Agricultural Show at Belgaum.
6. Running of Plants .	(*a*) Running of the Workshops and demonstration of the Water Lifts on the Experimental Well.
	(*b*) Running of the Nangaon Pumping Plant if required by the villagers.
7. Sale and hire of machines.	(*a*) Sale of boring machines, their spares and tools.
	(*b*) Hire of boring machines.
	(*c*) Hire of pumping plants.
	(*d*) Sale of other stores, tools and plants.
	(*e*) Hire of a motor plough in case of a demand.
8. General ..	(*a*) Routine work pertaining to office Workshops and divisions.
	(*b*) Charge and maintenance of the following :—
	The Nangaon Pumping Plant.
	The Boring machines at 3 depots.
	The Power Baling and Bruising Plant at Karajgi.
	The Steam Plough.

C. G. PARANJPE,
Agricultural Engineer to Government,
Bombay Presidency, Poona.

APPENDIX N.

Summary of work done under the Horticulturist to Government, Bombay. Presidency, Poona, for the year 1936-37.

I. Administration.

There were no changes in the permanent staff of this section. Mr. C. L. Barve, the Senior Mechanic of the Cold Storage Scheme, whose services were placed at the disposal of the Imperial Council of Agricultural Research at Delhi from 30th August 1936 has now resigned his post. His place has been taken up by Mr. K. S. Kalhon temporarily. Dr. D. V. Karmarkar, Senior Research Assistant under the Cold Storage Scheme was sent on deputation to England from 16th October 1936 to 4th March 1937 for a study of the gas storage.

II. Education.

Of the thirty-five students who appeared for the degree of B.Sc. (Agri.), all passed in Horticulture. There were twelve students for the practical training class at the Ganeshkhind Fruit Experiment Station, Kirkee, of whom four were from the Indian States. There were two special students for Horticulture, one from Assam and the other from Ceylon. One candidate registered his name for M.Ag., in Horticulture.

III. Research.

1. *Laboratory.*

The Laboratory continues to labour under handicaps due to lack of up-to-date equipment. Karvanda (Carissa Carandas) is receiving special attention from the point of view of its preservation. It is found to contain 28·41 per cent. total sugars as glucose and appears to be suitable for distillation. Investigations are also in hand in regard to the preservation of colour of Jambul juice and preparation of fruit syrups. Some samples of canned and bottled products were also examined and opinion given.

2. *Cold Storage.*

Experiments in regard to wrappers and packing material for cold storage of mango showed that they spoiled the fruit. A well ventilated crate 24″ × 12″ × 12″ holding 100 Alphonso fruits without wrappers has been found to be suitable for cold storage.

Fully ripe Nagpur oranges, even if not completely yellow, could be kept in good condition at 40° F. for three months. Preliminary cold storage trials of Malta oranges showed that when ripe they could be kept at 40° F. for four months without any wastage.

Tubers of seed potatoes could be kept in good condition without sprouting at 35° F. for 10 to 11 months.

Preliminary cold storage trials of Bananas from Madras, Chikus from Baroda and Apples from United Provinces were carried out.

A scheme for gas storage of fruits has been submitted to the Imperial Council of Agricultural Research.

3. *Vegetable Selection.*

Chillies.—Strain Nos. C-2, C-9, C-19-14 and 13-21 of the Deccan types were tried on a field scale in comparison with the locals in four replications. They all showed superiority over their respective locals but require further confirmation. Of the Udkai types, strain No. 43-29 and of the Dabkai types, strain Nos. 51-3 and 53-18 have given promising increases over their locals.

Brinjals.—Strain Nos. 28-21, 32-7, 32-10 and 34-27 of the Gote type and strain Nos. 8-3-24, 8C-2-24 and 27-32-6 of the Dorli type were tried in 5 replications. The increases were promising and consistent with the results obtained last year.

Experiments in the crossing of chillies could not be undertaken for want of time.

4. *Work at the Ganeshkhind Fruit Experiment Station, Kirkee.*

(*A*) *Banana varietal trials.*—Basrai is tried in comparison with the Walha with the result that bunch for bunch, the former possesses an inherent higher capacity to yield more than the latter. Observations in regard to the total income are being recorded.

(*B*) *Banana manurial experiments.*—(*a*) Response of Basrai to the applications of different fertilisers and manures on Nitrogen basis is being recorded. The manures were given in three equal dozes four months after planting.

(*b*) A new experiment is laid out in Latin Square randomization method with a view to fix up the optimum doze of Farm Yard Manure alone to the Basrai Banana. The dozes of Farm Yard Manure given are 40 lbs., 80 lbs., 120 lbs. and 160 lbs. per stool.

(*C*) *Mango manurial experiments.*—The stock seedlings have been grafted. Manures will be tried in due time.

(*D*) *Mosambi manurial experiments.*—Individual plant records showing the effect of different manures applied on Nitrogen basis were kept. Observations on the height and girth of the trees give no correlation, though girth seems to be more responsible for fruiting.

(*E*) *Improvement of guava by selection.*—Individual yield records of all varieties and selections were kept. No variety has yet been found superior to Lucknow No. 49.

(*F*) *Improvement of pomegranate by selection.*—G.B. No. 1 is the best in point of yield and quality. Dholka No. 101 and Dholka No. 133 were also found promising.

(*G*) *Improvement of grape vine.*—Selection No. 94 bore quite a successful crop this year.

(*H*) *Plant propagation experiments.*—(*a*) Top-grafting of the mango by inserting detached scion directly between the bark and the wood is in hand. The scion is surrounded with moist saw dust held in cardboard till it unites with the stock. July-October seems to be the best season for the operation and seedling trees are the most suitable for the purpose.

(*b*) Layering by etiolation is being tried in the case of guava. Rooted layers of seedless guava are planted as foundation nursery plants.

(*c*) Mango double grafts and Jambul grafts bore fruit for the first time. The dwarfish nature of the trees is very marked.

(*I*) *Orchard irrigation experiments.*—Different methods of irrigating the orchard were studied in grape vine and Mosambi plots. Irrigation in cross fourrows drawn beyond the drip of the crown was found to tend to luxuriant growth in the case of the grape vine. There was more wetting of the area and proportionately more consumption of water. The experiments will be continued for further confirmation of results.

(*J*) *Cultivation of foreign fruits and other selected varieties.*—The Marsh grape fruit has been growing successfully and yields profusely. The Italian lemon and navel oranges also bore well.

Mediterranean white figs bore for the first time and their performance record will be maintained.

Stoneless bor is likely to prove a valuable crop if proper tract is located for it.

(*K*) *Improvement of nursery.*—Jamburi stock seedlings have been graded for budding. Observations on the spacing of seedlings, season for sowing, budding stage and height of budding are being taken.

Mango seedlings are also being reared with a view to see if they can be ready for grafting in one year by giving frequent dozes of liquid cow dung manure.

IV. Work at the Modibag.

The garden is now a fully commercial concern and a place for the College teaching in Horticulture. Selected and reliable grafts and plants are sold to the public and necessary advice regarding cultivation, manuring, etc., is given along with the plants.

The area under nursery, Basrai banana and grape fruit is being extended.

The total receipts of the garden as credited into the Treasury during the year amounted to Rs. 4,003.

V. Agricultural Service and Propaganda.

1. *Fruit and vegetable markets.*

The Government of Bombay appointed a Provincial Fruit and Vegetable Market Committee for a period of one year in the first instance from 20th October 1936 with the Horticulturist to Government, as Chairman. This is indeed a great achievement and will prove a milestone in the development of fruit industry in the Presidency. The first meeting of the Committee was held in January 1937. The G. I. P. and B. B. & C. I. Railways have since extended the period of reduced rates on vegetables and fruits from certain stations to Bombay to another year. Besides this, a good deal of improvement is noticed in all directions in this field. It is hoped that this body will continue to be a permanent one to watch the interests of fruit and vegetable trade.

2. *Export of mango to England.*

During the year, elaborate arrangements were made for the export of Alphonso mango to England at the time of Their Majesties' Coronation. The merchants of the Crawford Market, Bombay, sent four consignments of about 7,000 fruits in all under the instructions of exporters, the Bombay Presidency Fruit Growers' Association. This section rendered technical help in grading and packing of the fruit. The fruit was consigned to Messrs. T. J. Poupart and Messrs. Woolf and Jacobs Ltd. It is hoped that a taste for the Alphonso is thus created in the English market. The Agricultural Marketing Adviser to the Government of India used his " Agmark " labels for the first time in this trade.

3. *Rural Uplift.*

A scheme for the formation of tree planting leagues in all villages was prepared and circulated to all the Collectors of the Districts. The scheme met a mixed reception. Anyhow a good quantity of seed of useful trees was distributed. Horticultural exhibits were prepared and sent for the Rural Uplift vans in Central Division and Southern Division. Horticultural lectures and demonstrations were given at the joint village Improvement and Agricultural Class arranged at Satara by the Collector of the district.

4. *Grading of mangoes and citrus.*

A scheme for grading of mangoes at Ratnagiri and Citrus at Raliuri was prepared and submitted to the Government.

5. *Advisory work.*

During the year under report, technical advice was rendered by personal visits in almost all the districts of the Presidency. Budding and grafting was done for the people at a large number of places and grafts, plants

cuttings, suckers and seeds were sold in places too numerous to mention. Horticultural instructions were imparted at 5 places in classes held at Satara, Gokak, Palghar, Malsiras and Dahigaon attended by 250, 100, 50, 50 and 75 pupils respectively. Horticultural Stalls were arranged at Sholapur, Kankavali, Surat and Malsiras. Technical advice was given in the oganization of All India Mango Show in Bombay and Fruit and Flower Show at the Empress Gardens. Jam and Jelly making and lime juice extraction were demonstrated at the classes and stalls. A big horticultural stall was put up at the Poona Industrial Exhibition which ran from 7th March 1937 to 18th April 1937. The stall was made very instructive by suitable placards specially prepared and lime juice extraction and jelly making were demonstrated from day to day. Departmental leaflets were freely distributed. The Horticulturist to Government delivered a lecture on the organization of fruit marketing to the officers of the Co-operative Department. Training was given to the administrative officers of the school board and Agricultural bias class teachers in the general principles in Horticulture, budding and grafting. One thousand three hundred and seventeen querries were replied by correspondence both in and out of the presidency. The district work is increasing in volume. The acreage under fruit trees is also increasing from year to year as could be seen from the increasing number of querries.

VI. Publications.

1. S. R. Gandhi—

   Recent investigations into the principles of irrigation and cultivation of orchards. Current Science, Vol. IV, No. 12—June 1936.

2. G. S. Cheema and R. S. Dubhashi—

   Reviews on (1) The storage of Trinidad Citrus fruits memoir 2 by Leonard and (2) The storage of West Indian mangoes, memoir 3 by C. W. Wardlaw and E. R. Leonard. Agriculture and Livestock in India, Vol. V, Part V—September 1936.

3. R. S. Dubhashi—

   A scheme of vegetable cropping designed to provide for a daily supply of 100 lbs. green vegetables throughout the year under conditions of soil and climate obtaining at Nasik. Poona Agricultural College Magazine, Vol. XXVIII, No. 3—December 1936.

4. G. S. Cheema, D. V. Karmarkar and B. M. Joshi—

   The Cold storage of Nagpur oranges: Indian Journal of Agricultural Science, Vol. VII, Part I—February 1937.

5. I. A. Sayed—

   Root exposure.

Poona Agricultural College Magazine, Vol. XXVIII, No. 4, February 1937.

Programme of work for the year 1937-1938.

1. Varietal trials of Bananas to be continued.
2. Manurial trials on mangoes, mosambi and Bananas to be continued.
3. Testing of finally selected guava, grape vines and pomegranates to be continued.
4. Plant propagation experiments.
5. Orchard irrigation experiments.
6. Introduction of new crops.
7. Grading of mangoes and oranges.
8. Nursery improvement.
9. Cold Storage and Gas Storage Research.
10. Vegetable Research—yield trials of the selections of chillies and brinjals.
11. The activities in regard to the Provincial Fruit and Vegetable Marketing work to be continued.

G. S. CHEEMA,
Horticulturist to Government,
Bombay Presidency, Poona.

COLLEGE OF AGRICULTURE,
Poona, 15th July 1937.

MO-III Bk Q 26—18

Abstracts of Publications.

1. "*Recent investigations into the principles of irrigation and cultivation of orchards*".

The author has reviewed at length the recent investigations into the principles of irrigation and cultivation of orchards done chiefly in the United States of America. It is observed that the moisture in the soil after it has attained the stage of "field capacity" does not appreciably move in any direction in the absence of standing water table. If the irrigation water wets a part of the root zone only, the roots in the wetted area will have water and the roots in the non-wetted area will suffer from lack of it. It is doubtful if mere cultivation of the surface conserves moisture or increases root aeration.

A natural means by which soils are ventilated and aerated has to do with fluctuations in moisture content. It is necessary to allow soil moisture to fluctuate in wide limits in order to allow the soil to attain the required temperatures for satisfactory root growth.

The main purposes of cultivation are: to remove weed competition, to facilitate irrigation or to aid in the absorption of water, to incorporate manures and to control pests.

2. *Reviews on*

1. The storage of Trinidad Citrus fruits.
2. The storage of West Indian mangoes.

In the first paper an attempt has been made to study the behaviour of the marsh grape fruit in particular and the oranges in general under storage conditions between picking and subsequent distribution.

The second paper discusses the problem of the behaviour of the mango under storage conditions in all its bearings.

3. *A scheme of Vegetable cropping designed to provide for a daily supply of 100 lbs. green vegetables throughout the year.*

This is an article of great practical utility. The author has given information in a tabular form regarding the planting of vegetable crops from month to month together with the seed rate, month of planting, method of planting, season of harvest and approximate yield per acre. It is likely to be of great use to the Deccan Districts.

4. *The Cold Storage of Nagpur Oranges.*

The cold storage behaviour of Nagpur oranges of three different stages namely, green, turning and yellow has been studied. The salient features of the results are that (*a*) fully ripe yellow oranges keep well for three

months at 40° F. ; (*b*) green and turning fruits lose their juice during storage ; (*c*) discolouration of the stem-end due to dark button is marked in green and turning fruits in the beginning of storage life ; (*d*) the fruits of all the stages develop internal break-down at 35° F. and 40° F. and that (*e*) at 45° F. and 52° F. there is wastage due to Alternaria disease.

5. *Root exposure.*

This article deals with the importance of root exposure as a measure to prevent trees from indiscriminate flowering and fruiting throughout the year or excessive vegetative growth. The factors affecting root exposure are (*a*) the nature of the tree ; (*b*) the soil ; (*c*) temperature ; (*d*) water condition and (*e*) flowering period. The process of root exposure have been fully described.

APPENDIX O.

Summary of work done under the Inspector of Agricultural Schools, Bombay Presidency, Poona, during the year 1936-37.

Charge.—The post of the Inspector of Agricultural Schools, Bombay Presidency, Poona, was held by Mr. R. Y. Hulkoti, from the beginning of the year till 29th March 1937, when he went on leave and still is on leave. No substitute has been entertained in his place. The Divisional Deputy Directors of Agriculture have been asked to make arrangements, through their District Staff, as far as inspection and examinations are concerned. The whole of the office work is being carried on by Mr. D. K. Shirsat, the Clerk under the supervision of the Director of Agriculture, Bombay Presidency, Poona.

Nature of work.—The nature of work continued to be the same as mentioned in the Annual Report of the last year. The Inspector of Agricultural Schools, Bombay Presidency, Poona, inspects the two Vernacular Agricultural Schools at Devihosur and Dhulia, managed by the Department and the third one at Rajapur managed by a private body. The Annual Examinations of these three schools are conducted by the Inspector of Agricultural Schools, Bombay Presidency, Poona, every year, but unfortunately the work of the Annual Examination during the year under report was entrusted to the District Staff of the Divisional Deputy Directors concerned as the Inspector was on leave. The work of the Annual Examinations of the Agricultural Bias Classes as far as the agricultural subjects are concerned has been entrusted to the District Staff. The work of inspection of these classes was done by the Inspector till the end of March when the Inspector proceeded on leave. The inspecting work was then entrusted to the District Agricultural Overseers and thus this kind of work was temporarily added to their multifarious duties.

Working of Vernacular Agricultural Schools.—All the three Vernacular Agricultural Schools at Dhulia, Devihosur and Rajapur, continued to do good work, during the year under report and have become very popular. The vocational education imparted in these schools has been highly appreciated both by the agriculturists and the general public, as could be easily seen from the rush of qualified students for admission into these schools. Some matriculates also got themselves trained through these schools.

As far as the Gujarat Division is concerned, the sons of genuine cultivators have been deprived of the advantage of this kind of vocational education since the closure of the Vernacular Agricultural Schools at Surat and Godhra. But the Vocational School at Ankleshwar, manned and managed by the Mission Society is doing excellent work in this direction but the activities are limited to the students from their Mission. The training given both to the teachers and boys, under the able management of the Principal in charge of the school is very efficient.

Vernacular Agricultural School at Devihosur.—This is the 23rd year of the existence of this school and this school continued to be, as popular as it used to be, under the able management of Mr. T. N. Chaugule, the present Head Master. In all 30 applications were received for admission into the school and 15 boys were selected for fresh admission. Varieties of crops were grown on the farm of 25 acres with student labour. The total expenditure was Rs. 7,697 and the total receipts credited into the Treasury were Rs. 938. The number of students on roll during the year under report was 30. Out of the 20 students of the I Year 19 appeared for the Annual Examination and 18 were promoted to the II Year. Out of the 10 students in the II Year 8 passed and 2 failed. The weaving continued to be the speciality of the school. Amongst the particular activities of the school may be mentioned Scouting which has been introduced during the year under report. The Scouts were presented with the scarps on 11th May 1937 at the hands of the Director of Agriculture, Bombay Presidency, Poona, when he paid a visit to this school. The Past Students' Association is doing good work. The Managing Committee met twice and the General Body Meeting was called once. The Boarding was managed by the boys themselves as usual and the average monthly expenses were Rs. 7-8-0 per boy. Out of the 247 students and 37 teachers sent out from this school, about 60 per cent. of these boys have taken to private farming. 50 per cent. of the teachers have been doing excellent. work in their schools. On the whole the progress of the school during the year under report was good.

Vernacular Agricultural School at Dhulia.—The Vernacular Agricultural School at Dhulia is now running its 14th year under the able management of the present Head Master Mr. S. S. Surve. The Local Advisory Committee continued to show earnestness in promoting the welfare of the school from all points of view. Poultry continued to be the speciality of this school. Medical help, which was the pressing need of the school, has been arranged during the year under report. The Past Students' Association has been working in its full swing. These boys are helping their fellow cultivators in their private farming as far as possible. The students sent out from this school have been employed as Kamgars in the Agricultural Department and the Taluka Development Association, as Talaties in the Revenue Department and as Assistant Teachers in the District Local Board Schools and their work has been very much appreciated by the different bodies under whom they are serving.

The students were taken on excursions during the year under report as usual to different places of importance from the Agricultural point of view.

Vernacular Agricultural School at Rajapur.—The Vernacular Agricultural School at Rajapur was started in the year 1929 and the same has been recognised and registered by the Educational Department and a token Grant-in-Aid of Rs. 400 was given to the school by the Educational

Department this year. The school was visited by the Director of Agriculture, Bombay Presidency, Poona, and the Director of Public Instruction, Bombay Presidency, Poona, and both of them expressed their appreciation. The Agricultural School Building, the foundation-stone whereof was laid down by the Honourable Sir D. B. Cooper, last year, is now complete and fully equipped with all the necessary furniture and apparatus. This school trains teachers working under District School Boards. Short tours to places round about the school were frequently arranged for the benefit of the students. About 10 such tours were arranged during the course of this year.

There is no Past Students' Association as such still formed by the school. Efforts are however made to keep the Institution in touch with the past students by frequent correspondence and information is being kept about their activities. Of the past students of this school, 5 are engaged as Kamgars, 3 are working as Mukadams on other's lands, 5 are working as Agricultural Bias Class Teachers in the District Local Board Primary Schools and in the Sawantwadi State.

The school farm has been shifted to a new site measuring about 10 acres of land, and has been laid out with some permanent fruit trees as Mosambis.

The total expenditure of the school during the year under report was Rs. 6,173 and total receipts including Government and District Local Board grants were Rs. 1,671.

The Annual Examination was held in the month of April and all 14 students passed in the Annual Examination.

More than 40 applications were received for fresh admission but 15 students were admitted.

On the whole the school is doing very useful work and gaining more and more popularity year by year. This is a good example of private enterprise in conducting an agricultural institution and deserves generous help from Government. The Principal of the English School Mr. Kulkarni to whom the school owes its existence is an enthusiastic worker and is popular amongst the rural population.

General.—The Vernacular Agricultural Schools have been of great help to the cultivators as most of the boys passed out of these schools have been doing excellent work on their own farms. Those who have gone in service also have been found to be of some outstanding merit. The school farms serve the purpose of field experiments and demonstrations. The past students' work is to be supervised and necessary help is to be freely rendered by the District Staff, but their present multifarious duties come in their way. Past Students' Associations make their work in this direction easy to some extent.

Another very useful work the Vernacular Agricultural Schools are doing is the Training of Teachers. The Agricultural Teachers required to run the Agricultural Bias Classes managed by the District Local

Boards and private bodies were trained at these Vernacular Agricultural Schools. But unfortunately this training work has been stopped though there is demand for increasing Agricultural Bias Classes from some District School Boards owing to the popularity of these classes in those districts.

Working of the Agricultural Bias Classes.—The number of the Agricultural Bias Classes remained unchanged during the year under report. The Southern Division has got the largest number of these classes and the Belgaum District has got the largest number, viz. 13 classes. On the contrary the Colaba District has no Agricultural Bias Class. The District Local Board, Bijapur, is prepared to open a few more Agricultural Bias Classes but as there is want of trained teachers, the Board has not been able to take any action in this direction.

Attempts have been made to minimise the expenditure and increase the receipts of the school farms and it is gratifying to note that more than 60 per cent. schools were able to credit more than 50 per cent. of the expenditure as receipts. The non-increase in the number of the Agricultural Bias Classes is mainly due to the stoppage of the training of teachers, as there are no trained teachers to replace the inefficient teachers. It would, therefore, be advisable if some more teachers are trained at the Vernacular Agricultural Schools at Dhulia, Devihosur and Rajapur.

It may be mentioned here that some of the past students of the Vernacular Agricultural Schools and Vernacular Final (Agricultural) students, who are now working in the Agricultural Bias Classes have been doing very good work as assistants to the Agricultural Bias Class Teachers and if such teachers are given further training in the teaching methods they will prove to be very efficient Agricultural Teachers. Agricultural Bias Classes in almost all districts have been specially entrusted to Special Supervisors in addition to the inspection of a few of the ordinary schools. This has not only helped in bringing about uniformity in the work done but these classes have also been greatly improved both in quality and quantity. It will be desirable if all subjects of the Vernacular Final Examination with the Agricultural Bias Course are entrusted to the Special Supervisors in charge of the Agricultural Bias Classes since they are in touch with what is required and what has been taught to the boys in the Agricultural Bias Course, instead of the District Agricultural Overseers and teachers in High Schools who are not expected to be quite in touch with the work of these classes.

Rural Training Schools.—There is only one Government Rural Training School at Loni in the Central Division. One more Rural Training School at Satara in the Central Division has already been started by a private body and recognised by the Educational Department. The students turned out of these Training Schools are engaged as assistant teachers in the Agricultural Bias Classes in the Central Division and are found of great help to the Agricultural Teachers. If

such Training Schools are opened in other Divisions also, the purpose of the Rural Uplift Work will be served to a great extent, through the teachers passed out from such schools. It will also be of great help to introduce agricultural bias in all rural schools generally instead of limiting the course to a few scattered schools as at present existing.

Rural Clubs.—Rural Clubs have been started in almost all Agricultural Bias Class Schools under the guidance of the Head Master of that school but they are still in their infancy. They are at present doing pretty good work by way of inducing the cultivators to introduce the agricultural improvements. The members of these Rural Clubs—past students of the Agricultural Bias Classes—have through their association been brought into closer contact with the agricultural teachers and District Agricultural Officers in order to know the up-to-date agricultural improvements. What is needed is the progress of work on students' own plots which will appeal to the cultivators more than their advice.

Agricultural Education in High Schools.—The introduction of the special agricultural course in the two High Schools at Rajapur and Bordi has not affected their usual course at all and it has been found to be quite successful. The authorities of other High Schools such as Dholka, Palghar, Bhallod, Yawal, Bhusawal and Bagalkot are seriously thinking of introducing the special agricultural course in their High Schools. But their difficulties are of increased expenditure on special teacher, plot of land and cultivation. Generous grant from Government will enable such institutions to take up the training of students in the principles and practice of agriculture to a certain extent and thus ruralise the courses given there.

Text Books.—There are no suitable text books in Vernaculars for the use in the Agricultural Bias Class Schools. There are few books in Marathi and Kanarese which are mostly useful for teachers only.

Syllabus.—The revision of the syllabus for the use in the Primary Schools is still under consideration. It is necessary that agricultural bias course should form part of the general course and made compulsory in all the rural areas.

Refresher Course.—As per G. R., E. D., No. 5443, dated the 19th December 1936, Special Classes for Officers and Refresher Courses for the Agricultural Bias Class Teachers for a period of 6 days and 13 days respectively were conducted by the Inspector of Agricultural Schools, Bombay Presidency, Poona, on the Arbhavi Farm for the Karnatak Division and at the Agricultural College, Poona, for the Maharastra. The Classes at Surat for the Gujarat Division were conducted by Mr. J. G. Naik, the Superintendent, Surat Farm, with the help of Mr. D. K. Shirsat, Clerk to the Inspector of Agricultural Schools, Bombay Presidency, Poona, on account of the Inspector being on leave. Almost all the Administrative Officers, Senior Assistant Deputy Educational Inspectors, Special Supervisors, Agricultural Bias Class Teachers and their Assistants attended these classes. Agricultural Teachers from private schools also were deputed to attend these classes. All the three

classes were very successful. But it may be mentioned here that the class held in Poona at the Agricultural College was very much appreciated owing to the facilities of apparatus and the advantage of the Experts of the various branches who gave our Officers and Teachers in different batches a gist of the practical work done in their respective sections together with necessary background sufficient to understand the technical work explained by them.

The Officers and Teachers were taken on excursion to see the actual working of one or two typical agricultural bias classes and the work on the Government Farms.

The opening ceremony of the Poona Class was performed by the Honourable Mr. B. S. Kamat, who was member of the Royal Commission on Agriculture that recommended the multiplication of such classes. He explained the objects of these classes and gave an appealing advice to all concerned in the movement as to what was required of the Officers and Teachers, emphasised the personal factor and the equipment of proper knowledge on the part of the teaching and inspecting staff. The Deputy Director of Public Instruction, Bombay Presidency, Poona (Mr. Moos), paid a visit to the class and after expressing his satisfaction at the hand work exhibited by the different classes in the Marathi Speaking Division offered a donation of Rs. 10 to the Ozar-Tambat Agricultural Bias Class. The closing function was performed by the Principal, College of Agriculture, Poona.

The closing function of the Classes at Arbhavi Farm was performed by Mr. K. S. Vakil, retired Educational Inspector.

The closing function of the Classes at Surat was performed at Ankleshwar by Rao Bahadur Bhadrapur, the Collector of Broach and Panch Mahals.

On the whole all the three Refresher Classes proved to be very successful and helpful both to the Inspecting Officers and Teachers and it was expressed by the Officers and the Teachers that such Refresher Courses would be very useful if arranged once in every three years.

General.—Since agriculture forms the mainstay of the masses it is necessary that agricultural education both of vocational and prevocational type should be developed as far as possible. From the point of both economy and spread amongst rural areas Vernacular Agricultural Schools may be added on to the existing farms and the Agricultural Bias instruction may form part of the general primary course. A Conference of Officers of the Departments of Education, Agriculture and of Local Bodies and of leading public interested in the education of the masses seems of advantage to discuss the difficulties in the way of agricultural education.

(Signed) R. Y. HULKOTI,

Poona, 13th September 1937. Inspector of Agricultural Schools,
Bombay Presidency, Poona
(on leave).

Programme of work under the Inspector of Agricultural Schools, Bombay Presidency, Poona, for the year 1937–38.

(1) Inspection of the Agricultural Bias Classes of the Presidency proper.

(2) Inspection and Examination of the Vernacular Agricultural Schools.

(3) Watching the progress of the Vernacular Agricultural Schools and making the Vernacular Agricultural Schools as popular and economic as possible.

(4) To push forward the movement of the Rural Clubs and watching the progress of these Clubs and that of the Past Students' Associations of the Vernacular Agricultural Schools.

(5) To offer advice to the Local Authorities and the Officers of the Educational Department in the matter of starting more Agricultural Bias Classes.

(6) To watch how the syllabus, circular on by-industries, note on observation and standard time-table are being followed in the Agricultural Bias Classes.

(7) To supply the list of experiments to all Agricultural Bias Classes in different Vernaculars when asked for.

(8) To organise some conference of the agricultural teachers and supervisors of some districts during my touring.

(9) To hold the Training Classes for the training of Special Supervisors and the Administrative Officers.

(Signed) R. Y. HULKOTI,
Inspector of Agricultural Schools,
Bombay Presidency, Poona
(on leave).

Poona, 13th September 1937.

APPENDIX P.

SUMMARY OF THE WORK DONE UNDER THE PROFESSOR OF AGRICULTURAL ECONOMICS, AGRICULTURAL COLLEGE, POONA, AND PROVINCIAL MARKETING OFFICER, BOMBAY PRESIDENCY, POONA, FOR THE YEAR 1936-37.

Dr. M. B. Ghatge who was on leave abroad for two years for higher studies in agricultural economics joined as Professor of Agricultural Economics on 29th August 1936 relieving Mr. G. P. Patil. In addition to his own professorial duties Dr. M. B. Ghatge was entrusted with the work of Provincial Marketing Officer from 4th February 1937. Mr. E. J. Bruen, Livestock Expert to Government of Bombay, Poona, held charge of this work of Provincial Marketing Officer till that date. Messrs. N. V. Bhagwat, M. M. Desai, B. H. Patil and B. P. Deshpande continued to act as Assistant Marketing Officers and Messrs. K. M. Shah and K. S. Patel as Demonstrator and Investigator in Agricultural Economics respectively.

EDUCATION.

Students were taught Agricultural Economics—a subject which is compulsory for the B.Sc. (Agri.) Examination. At the March 1937 examination, 32 students came out successful in this particular subject but on the whole 12 dropped out. All five of the last year's failures in Advanced Agricultural Economics came out successful.

RESEARCH (A).

The study of the economics of farming in the Charotar tract of Gujarat was continued in its fourth year.

Season.—Rains set in the second week of June and continued till the end of the last week of July making a total of 4½ inches at Anand. Sowing of *kharif* crops such as paddy, *kodra, vagardu* and of tobacco for seedlings was completed but a long break of about six weeks supplemented by the attack of hairy catterpillars damaged standing crops and delayed transplanting of tobacco which is generally done in the first fortnight of August. The last week of August and the first week of September brought in heavy rains but a similar six-week break from 12th September to 10th November was experienced. The season was precarious owing to long breaks and occurrence of frost; frost occurred in the 1st week of January; it damaged the then standing crops like tobacco and *tur*. Out of four years of the study three years experienced frost.

Farmers, farm area and cropping.—The same 31 armers, as those in the previous years consisting of 20 *patidars* and 11 non-*patidars* were continued under observation. Out of the total farm area of 226 acres 20 gunthas, 90·3 per cent. was under cultivation and 9·7 per cent. under *sheda* grass. The average holding per farmer worked at

7 acres 12·3 gunthas out of which 4 acres 2 gunthas were fully owned, 3 acres 32 gunthas were taken on lease and mortgage and the remaining 6·8 gunthas were cultivated in partnership. The cropped area worked to 251 acres 36 gunthas the double cropped area of 12·4 per cent. of the total net cropped area being added. The cropping during the year was as under :—

Table 1.

No.	Crop.	1935-36.		1936-37.	
		Area.	Per-cent.	Area.	Per cent.
		A. g.		A. g.	
1	Tobacco	80 11	34·37	84 35	33·7
2	Tobacco (Calcutty) ..	3 34	1·65	3 34	1·65
3	*Bajri* mixture	44 20	19·06	41 11	16·4
4	Bajri (irrigated)	..	...	4 31	1·9
5	Paddy mixture	15 12	6·56	14 19	5·8
6	*Kodra* mixture	17 9	7·38	14 31	5·9
7	*Vagardu* mixture	38 31	16·60	39 12	15·6
8	*Bavto* mixture	2 9	0·95	0 33	0·3
9	*Sundhia* (main crop) ..	13 10	5·67	23 30	9·4
10	*Sundhia* (2nd crop) ..	10 4	4·32	14 13	5·7
11	*Sundhia* (irrigated) ..	..	..	1 9	0·5
12	Cumin	5 13	2·28	..	..
13	Rai and Asalio	1 5	0·48	..	..
14	Brinjals	..	..	1 0	0·4
15	Cotton	..	..	2 28	1·1
16	Wheat and potatoes ..	..	..	0 22	0·2
17	Grass land	1 24	0·68	1 22	0·6
	Total ..	233 22	100·0	251 36	100·0

The above table indicates that the area under grains, tobacco, fodder and miscellaneous crops formed 45·9 per cent., 36·2 per cent., 15·6 per cent. and 23·6 per cent. respectively of the total cropped area. The area under grains decreased by about 4 per cent. while that under fodders and

miscellaneous increased by about that much over the previous year. The important feature of the year was that cumin and fennel—the important irrigated money crops—were discontinued owing to poor prices and trouble from diseases in the previous years. New crops like brinjals, cotton, wheat and potatoes were introduced instead. The yields of the various crops have not been very satisfactory owing to the precarious season. The yields for the past four years were as under :—

Table 2.

Crops.	Average yield per acre during			
	1933–34.	1934–35.	1935–36.	1936–37.
	Lbs.	Lbs.	Lbs.	Lbs.
Bajri	500	563	704	521
Vagardu	1,110	1,159	867	752
Kodra	840	962	1,165	685
Paddy	1,060	1,267	1,514	795
Sundhia (main crop) ..	937 (bun.)	623 (bun.)	612 (bun.)	700 (bun.)
Sundhia (2nd crop) ..	344 „	250 „	257 „	313 „
Tobacco (local)	527 lbs.	425 lbs.	526 lbs.	601 lbs.
Tur	....	511 „	637 „	142 „

The above table indicates that the yields of food crops were the least except that of *bajri*; fodders and tobacco gave better yields but the quality especially of the latter was much below mark.

Labour.—Both human and bullock labour consisted of home labour, exchange labour, hired labour and labour obtained *gratis*. The proportion between them during the year was as follows :—

Table 3.

—	Men.	Per cent.	Women.	Per cent.	Bullocks.	Per cent.
Home labour ..	6,186·0	60·0	993·75	40·9	1,739·0	51·7
Exchange labour.	774·0	7·5	13·5	0·5	668·25	19·9
Hired labour ..	2,507·0	24·3	1,398·75	57·7	332·0	9·9
Gratis labour ..	844·875	8·2	23·5	0·9	623·5	18·5

The home human labour was contributed mainly by the members in the families of the farmers. They were as under :—

Table 4.

Village.	Number of families.	Men.	Women.	Children.	Total.
Samarkha	10	17	16	24	57
Kasor	10	11	12	22	45
Nisaraya	11	28	20	25	73
Total ..	31	56	48	71	175

Bullock labour.—During the season 17 of the farmers maintained a single bullock each, 6 of them had a pair of bullocks each and the remaining 8 owned no bullock. In spite of the fact that the majority of the farmers keep only one bullock they could not provide full time work to them as observed from tables 6 and 7.

Labour requirements of Crops.—The total human and bullock labour required for growing crops on all 31 farms was 11,162·875 units and 3,362·75 units respectively. The percentage contribution for various crops was as follows :—

Table 5.

Crops.	Units of human labour used on the total area under each crop.	Percentage unit of human labour used out of total used on the 31 farms.	Units of bullock labour used on the total area under each crop.	Percentage unit of bullock labour used out of total used on the 31 farms.
Tobacco (local)	5,271·625	47·2	1,594·0	47·5
Tobacco (Calcutty) ..	241·25	2·2	45·0	1·4
Vagardu, kodra and paddy mixture.	2,405·0	21·6	598·0	17·8
Bajri mixture	1,565·75	14·1	432·0	12·3
Bajri (irrigated)	258·0	2·3	42·5	1·3
Sundhia (main)	804·75	7·2	295·75	8·8
Sundhia (2nd)	128·0	1·1	104·0	3·1
Jowar (irrigated)	26·5	0·2	4·0	0·1
Wheat and potatoes ..	129·5	1·2	90·5	2·8
Brinjals	77·0	0·6	40·5	1·2
Cotton	103·5	0·9	28·5	1·0
Bavto	22·5	0·2	4·5	0·1
Waste units	128·5	1·2	83·5	2·6
Grass land	1·0	....	....	....
Total ..	11,162·875	100·0	3,362·75	100·0

Utilisation of man and bullock labour.—The utilisation of the total available home labour in the case of men and bullocks indicated that the 25·4 per cent. and 17·4 per cent. of the total available units respectively were used on farm work and 26·0 per cent. and 64·82 per cent. respectively remained without any work. The following table points out the details:—

Table 6.

—	Man units used.	Percentage utilisation to total available units.	Bullock units used.	Percentage utilisation to total available units.
Units used for farm work ..	5,121·5	25·4	1,819·75	17·4
Units used for cutting and bringing *sheda* grass.	1,278·75	6·3	....	....
Units exchanged	489·0	2·4	638·0	6·08
Units given *gratis*	345·5	1·7	593·75	5·7
Units used for hire work ..	1,607·25	21·9	460·25	4·29
Units used for miscellaneous work.	4,427·25	21·9	460·25	4·29
Units used on social functions	1,188·5	5·9	....	....
Units without work ..	5,371·75	26·6	6,806·0	64·82
Units not available (days of sickness).	355·75	1·2	....	....
Total available units ..	20,185·25	100·0	10,485·25	100·00

From the above table it cannot be concluded that the farmers idled away time. The periodical distribution of labour indicated that certain months were of great rush of work both for human and bullock labour. In July, August, September and October the percentage of units of work for men to total available was 80 per cent. and above; in May, June and July the percentage of units of work for bullocks went up from 48 per cent. to 76 per cent. The details for the percentage of working units to total available month by month are as under:—

Table 7.

—	April.	May.	June.	July.	August.	September.	October.
Man ..	58·3	66·2	67·7	83·0	79·6	81·0	82·6
Bullocks ..	30·7	48·1	62·3	76·0	39·9	34·5	31·7
—	November.	December.	January.	February.	March.	April.	May.
Man ..	71·3	74·5	70·2	62·8	62·8	61·7	64·0
Bullocks ..	29·2	16·8	15·0	20·6	20·8	17·1	31·7

Woman labour.—Women of the farmers of this tract remained fully busy throughout the year. They looked after the milch cattle over and above their household duties; they went to the fields for doing light works such as weeding, bringing green grass from the fields, etc., whenever they found time. The employment of home woman labour for *patidar* farmers worked at 29·1 per cent. while for non-*patidar* farmers it worked at 62·9 per cent. of the total woman labour used on the farms the details of which are as follows :—

Table 8.

——	*Patidars.*	Non-*patidars.*	Both.
Home labour	29·1	62·9	40·9
Exchange labour	....	1·6	0·5
Day labour	70·7	33·1	57·7
Gratis	0·2	2·4	0·9
	100·0	100·0	100·0

Capital.—The position of fixed and operating capital and of debt per farm for the last four years was as below :—

Table 9.

Year.	Fixed capital.		Operating capital.				
	Land and its fixtures.	Houses and cattle shed.	Live-stock.	Imple-ments and tools.	Material on hand.	Cash on hand.	Amount due from others.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1933–34 .. (beginning).	2,542	1,117	160	47	123	17	60
1934–35 ..	2,513	1,657	142	44	141	18	63
1935–36 ..	2,780	1,754	145	45	107	40	59
1936–37 ..	2,792	1,710	140	40	120	16	67
		Debt Average per farmer.					
		Rs.					
1933–34 .. (beginning).		895					
1934–35 ..		968					
1935–36 ..		1,087					
1936–37 ..		1,117					

The above table indicates that the fixed capital increased during the four years under study but the debt also increased. There is not much variation in the operating capital except in livestock which shows a continuous decline.

Costs, receipts and income.—The position of the costs, receipts and incomes from farming, dairying and from miscellaneous sources separately for the past four years was as follows :—

(*a*) Farm—

Table 10.

—	Average holding.	Total value of yield.	Cost excluding wages for family labour.	Family labour income.	Farm business income.	The average farm business income per unit of human labour.
	A. g.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1933–34 ..	5 ·18 ·67	833 15 1	357 7 8	3 8 7	90 2 11	0 5 7·5
1934–35 ..	7 32·5	463 13 3·5	365 10 7·5	43 2 8	123 15 6	0 8 4
1935–36 ..	7 18·5	397 11 11	362 9 10	35 2 1	129 3 2	0 9 6·5
1936–37 ..	8 5·3	448 1 6·4	425 4 5·2	22 13 11	127 05·5	0 9 3·6

(*b*) *Dairying.*—Keeping milch cattle on the farm for dairy purposes forms a very important subsidiary industry in this tract. It provided the female members of the family with work and with ready money to meet daily needs. Twenty-eight farmers maintained one or more buffaloes and the remaining could not keep any as they had no female members who would look after them.

Production and disposal of milk.—During the year under report, the total quantity of milk produced on the 31 farms was 95,892 lbs. Out of this quantity nearly 43 per cent. was turned into curds for preparing ghee while the remaining 16 per cent. was consumed by the farmers' families. The consumption at home worked to 6·9 lbs. of milk and about 25 tolas of ghee per month for each member of the family.

Table 11.

Total milk produced.	Milk sold.	Price of milk sold.	Milk used by the farmer's family.	Value of milk used by the farmer's family.	Milk turned into curds for keeping ghee.
Lbs.	Lbs.	Rs. a. p.	Lbs.	Rs. a. p.	Lbs.
95,892	40,878¾	1,669 6 3	15,523¼	669 4 9	39,490

Ghee produced.	Ghee sold.	Price of ghee sold.	Ghee used by farmer's family.	Value of ghee used by the farmer's family.
Lbs. oz.	Lbs. oz.	Rs. a. p.	Lbs. oz.	Rs. a. p.
3,238 0	1,734 5	1,049 5 6	1,397 10	833 5 6

Costs and receipts.—The cost includes increase or decrease in the value of stock, feeding and miscellaneous expenses, interest and depreciation, whereas receipts included value of milk and ghee sold and realisations of manure. The following table gives the details ;—

Table 12.

Village.	Total cost.	Total income.	Family labour income.	Dairy business income.	Average dairy business income.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Samarkha ..	1,504 1 0	2,010 2 6	506 1 6	680 3 0	88 0 3·6
Kasor ..	789 2 0	997 14 0	208 12 0	298 13 0	29 10 10·8
Nisaraya ..	1,356 9 3	1,872 11 3	516 2 0	713 4 0	64 13 5·5
Total ..	3,649 12 3	4,880 11 9	1,230 15 6	1,692 4 0	168 8 7·9

The average dairy business income of a non-*patidar* farmer was Rs. 59–12–2·9, while of a *patidar* farmer Rs. 51–10–3·3, a difference of Rs. 8–1–11·4. The reason was that the non-*patidar* fed his buffaloes on green leaves, etc., which cost him less.

Miscellaneous income.—The miscellaneous income differed widely with social status. *Patidars'* earnings came to Rs. 123–7–4, while that of a non-*patidar* farmer came to Rs. 78–0–6·8 which were less by Rs. 45–6–9·35. The following table indicates the sources and the amounts under miscellaneous income.

Table 13.

	Patidars.	Per cent.	Non-*patidars.*	Per cent.
	Rs. a. p.		Rs. a p.	
1 Wages earned ..	18 6 0	1·05	212 12 0	25·37
2. Incomes from business ..	823 8 0	46·28	430 14 0	51·37
3. Carting charges earned ..	91 1 0	6·05	57 13 6	6·90
4. Service	783 4 0	44·00	60 0 0	7·17
5. Income from fruit trees ..	41 0 0	2·32	31 0 0	3·70
6. House-rent	23 0 0	1·30	....	....
7. Watching	....	....	46 0 0	5·49
Total ..	1,780 3 0	100·0	838 7 6	100·0
Average per farmer ..	89 2 4·8		76 3 8·2	

Total business income.—Putting the three sources of earnings of farmers in Charotar tract together the position stood as follows :—

Table 14.

—	Farm.	Dairying.	Miscellaneous	Total.	Per number per day.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1933–34 ..	90 2 11	38 11 4	106 11 3	235 9 6	0 1 11·6
1934–35 ..	127 2 9	42 7 11	78 14 1	248 8 9	0 2 0·0
1935–36 ..	130 9 2·7	41 4 0·2	126 9 9·3	298 7 0·5	0 2 3·6
1936–37 ..	127 0 5·5	54 8 4·6	107 5 5·6	288 14 3·7	0 2 1·6
Average of four years.	118 11 10	44 3 11	104 14 1	267 13 10	0 2 1·2

The above table shows that the total income which yielded annas 2–1·3 per head per day during the year under report was made up by incomes from farming, dairying and miscellaneous to the extent of 74·5 per cent. 16·2 per cent. and 39·3 per cent. respectively. The dairy income showed a tendency to increase during the past four years, farm income showed steadiness while miiscellaneous showed no definite tendency.

Research (B).

The data of the study of the economics of a dry area at Islampur, Kanher and Malsiras in the Sholapur District undertaken in the year 1930–31 have now been collated: The data for five farmers at Malsiras has been separated from those of Islamapur and Kanher. The position thus with regard to family labour income and farm business income for Kanher, Islampur and Malsiras is as follows :—

Table 15.

Village.	Year.	Cropped area per farmer.	Family labour income per farm.	Farm business income per farm.	Farm business income per man day of work.	Remarks.
		A. g.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Kanher ..	1930–31 ..	24 35	51 5 9	27 6 8	0 1 5	Average of 8 farmers.
	1931–32 ..	23 34	64 3 6	131 5 8	0 7 5	
	1932–33 ..	23 34	6 11 8	88 5 8	0 5 4	
	Total ..	72 ·23	19 9 5	247 2 0	0 14 2	
	Average ..	24 7·6	6 13 9	82 6 0	0 4 8	

Table 15—contd.

Village.	Year.	Cropped area per farmer.	Family labour income per farm.	Farm business income per farm.	Farm business income per man-day of work.	Remarks.
		A. g.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
Islampur ..	1930-31 ..	19 2	−50 14 3	33 15 3	0 2 3	Average of eight farmers.
	1931-32 ..	20 4	32 6 7	102 8 1	0 6 4	
	1932-33 ..	19 18	27 1 7	97 9 2	0 5 9	
	Total ..	58 24	8 9 11	234 0 6	0 14 4	
	Average ..	19 21·3	2 13 11	78 0 2	0 4 9	
Malsiras ..	1930-31 ..	24 3	57 5 5	78 1 9	0 5 9	Average of five farmers.
	1931-32 ..	20 9	14 12 1	144 6 7	0 8 4	

Agricultural Marketing Survey.

Reports on hides and skins and coffee were submitted early this year. Thus the surveys of the following commodities have now been completed :—

Cereal group—Wheat and rice.

Oilseed group—Groundnut and linseed.

Special crops group—Tobacco, bananas, grapes, strawberries coffee.

Animal husbandry group—Cattle, milk, eggs, hides and skins.

Hides and skins—The estimated production of hides and skins in the Presidency is as under :—

	From slaughter.	From death.	Total.
	No.	No.	No.
Hides	184,000	947,173	1,131,173
Skins	1,850,000	1,750,000	3,600,000

Allowing for exports and imports, the number available for use in this Presidency stands at 955,345 in hides and 190,150 in skins; 260,000 of the hides are used in central tanneries, the remaining valued at Rs. 18,25,000 are available for small tanneries.

With regard to skins, much of the stuff is exported in raw state partly to Madras and partly to foreign countries. Some Deccan tanners import raw hides from Madras which are comparatively inferior to local. Raw hides from Sholapur are superior in quality. Gujarat hides are inferior owing to flesh adhering. Gujarat skins are inferior to those from Deccan. The main defects observed during the survey were :—

(1) The flayers appeared to be totally unmindful of the flayer's defects in hides.
(2) The preparation and after-treatment of raw hides and skins with improper use of salt.
(3) Tanners in Gujarat yet do not know the use of lime in tanning.

Coffee.—Coffee is not produced on a commercial scale in this Province. Most of the supply of coffee required in this Province is imported from Mysore State and Madras Presidency. It is estimated that the total quantity of coffee consumed annually (in terms of cured beans) is less than two tolas (nearly 1·6 tola) per head in this Presidency. There is therefore a considerable scope for the extension of the use of this beverage in this Province. This was realised by the Coffee Cess Committee, and they have already made arrangements for popularising this drink in Bombay.

It is worth noting that the use of pure coffee is extremely limited. Nearly 4,000 cwts. of chicory are imported annually (mainly from Germany and Belgium) for mixing with coffee. The proportion of chicory in the mixtures, placed on the market, varies extensively. It is therefore in the interest of the consumers and even of the growers, that the manufacturers of coffee, who roast, grind, blend and pack the coffee for the market should be compelled to indicate the proportion of chicory in the contents, on the labels affixed to the containers.

PUBLICATIONS.

Mr. K. M. Shah—Market quotations and how to read them (Poona Agricultural College Magazine, Vol. XXVIII, No. 1—series continued from the previous year).

Mr. K. M. Shah—The world trade depression, its causes and cure (The Poona Agricultural College Magazine, Vol. XVIII, No. 2).

M. B. GHATGE,
Professor of Agricultural Economics
and
Provincial Maketing Officer,
Bombay Presidency, Poona.

College of Agriculture,
Poona, 22nd July 1937.

Programme of Work under the Professor of Agricultural Economics and Provincial Marketing Officer, Bombay Presidency, Poona, for the year 1937-38.

(1) To continue the study of economics of mixed farming with dairying as subsidiary occupation of the Charotar tract of Gujarat.

(2) To compile the past four years' data of the economic study of Charotar tract.

(3) To write up the report on the collated material of the Malsiras study during 1930-31 and 1931-32.

(4) To teach Agricultural Economics to the students of the College.

(5) Supervision of the marketing survey work, consisting of the writing up of the preliminary reports of the commodities already under investigation, of collection of supplementary information required by Central Staff of organisation of the survey of the commodities which may be decided in the coming meetings of the Marketing Officers at Simla.

M. B. GHATGE,
Professor of Agricultural Economics
and
Provincial Marketing Officer,
Bombay Presidency, Poona.

College of Agriculture,
Poona, 22nd July 1937.

APPENDIX Q.

Summary of Work done under the Professor of Agricultural Engineering, Physics and Mathematics for the year 1936-37.

Administration..

During the year under report I was on leave for two months from 10th May 1937 to 9th July 1937, when Mr. A. A. Vasavada acted for me. I was in charge of the office for the remaining period. This section attends to the teaching duties at the College, Research on Soil Erosion and District enquiries and advice on Land Development.

Staff.

The staff consists of two assistants, a Lecturer and a Demonstrator, both graduates in the upper subordinate cadre.

I. Teaching.

Two subjects, viz. (1) Physics and Mathematics and (2) Agricultural Engineering, together with their Laboratory and field work are taught by this section. This year the subject of Agricultural Engineering was taught to S.Y.Sc. (Agri.) students and was finished during that year according to the new course.

Physics and Mathematics.

Class.	Number appeared.	Number passed.	Percentage passed.
F. Y. Sc. (Agri.)	93	59	63·44

Agricultural Engineering.

Class.	Number appeared.	Number passed.	Percentage passed.
S.Y.Sc. (Agri.)	60	53	88·33

II. Research.

Levels for all the Research Schemes on hand for this year have been taken and some of them plotted. The record is maintained and some of the results are being worked up.

1. Study of Soil Erosion.

(*i*) 30 *Acre plot near Chatursingi hill.*—The light showers up to the middle of September caused slight erosion. Heavy rainfall from mid-September to mid-October caused overflow from the trenches and a larger quantity of silt was collected. The subsequent light showers caused less erosion. The heavy rainfall (about $1\frac{1}{2}$″) in April this year again caused erosion.

Statement showing silt collected in the trenches below the sub-plots.

Period.	4 guntha cultivated.	4 guntha uncultivated	3 guntha cultivated.	3 guntha uncultivated
1936.	Lbs.	Lbs.	Lbs.	Lbs.
Mid-May to mid-September ..	96	158	74	138
Mid-September to mid-October	276	503	247	397
Mid-October to mid-December	103	202	76	185
1937.				
April	56	135	56	115

Silt at about $2\frac{1}{4}$ tons per acre was washed down from the cultivated plots and at the rate of about $4\frac{1}{2}$ to 5 tons per acre from the uncultivated ones. The average depth of washing amount to ·01″ from the cultivated and ·02″ from the uncultivated plots.

This year's erosion is about half that of last year, and though the area has been fairly eroded, further erosion continues.

Rainfall Statement.

Year.	Total Rainfall.	Number of rainy days.	Number of days with rainfall of			Rainfall for					
			0·5″ to 1″.	1″ to 1·5″.	1·5″ and above.	June.	July.	August.	September.	October.	November.
1935–36	23·25	77	7	1	6	5·11	4·96	4·9	3·31	5·64	0·09
1936–37	15·22	71	6	2	1	3·61	1·61	1·34	1·11	0·46	2·27

It would be seen that in the year 1935–36 there were 6 days on which the rainfall was above 1·5″ per day, as against only one day in 1936–37. The comparison of the erosion figures in the above table is interesting. 1935–36 shows decidedly more erosion for both the type of plots than 1936-37. Though there is slight difference in the number of rainy days for both the years, the total rainfall was less in 1936-37. But in 1935-36 the total rainfall was made up by rainfall less than ·05″ per day.

Rainfall over 1·5″ per day seems to have a decided tendency for erosion.

(*ii*) *Erosion in Gullys.*—Two gullys under observation in the 30 acre plot show an erosion of beds and banks in general. The bed gradients seem to have a tendency to steepen. Silt is deposited where there are pockets due to drops or at bends or at places where the gully broadens out.

(*iii*) *Steep and Moderate grade lines.*—Two lines on steep slopes near the 30 acre plot, though having eroded soil, show a slight degree of further erosion. Another line on a moderately flat slope in the Kirkee Cantonment area nearby shows similar tendency.

2. Katraj Valley Terrace Observations.

The first monsoon showers were not effective. The heavy shower at the end of September brought down silt from the higher reaches in a terrace under observation which shows some silt filling. Unfortunately the land was ploughed by the cultivators before levels could be taken for the year. The heavy rains caused breaches and washing in some of the lower terraces.

3. Diva Ghat Area Observations.

Low loose stone bunds put up across the five gullys in the Divaghat area show appreciable silt filling due to the heavy shower of 29th September 1936. The upper terraces have more filling than the lower ones and have flattened out almost up to the top level. The maximum filling in one of the terraces is about 2½ feet and minimum about a quarter of a foot.

4. Karjat Valley Rice Terrace Observations.

The lines under observation in these terraces have a flat slope and show a tendency to flatten out.

5. Pashan Valley Terraces.

The rainfall on this side was negligible and no appreciable effect of erosion is observed by the naked eye. Unfortunately the land was ploughed by the cultivator before levels could be taken for the year.

6. Erosion in Gullys near Gujarat Rivers.

It is desirable to compare the effect of erosion in gullys in deep heavy and light soils near Gujarat Rivers. A list of places where such erosion occurs in Broach District has been received from the Agricultural Overseer. The sites will be visited and a suitable site selected for observation.

7. Erosion and Silting Observations in S. D. and S. C. D. through the Agency of the Bunding Officers.

Some sites were visited but the Deputy Director of Agriculture, S. D., suggested that his Bunding Officer had so much work to do that he could not take up any such additional work. The Bunding Officer, S. C. D., is also equally busy and hence this will have to be dropped unless more staff is available for such work.

8. Register of Land Development Schemes.

The undersigned visited some typical places in the district where erosion takes place and preventive measures adopted. Suggestions for modifications where necessary were offered.

9. Soil Erosion Bulletin.

The compilation of the information is continued. Some more literature from U. S. A. is ordered out and awaited. The undersigned was on leave for two months when the College was closed and the staff in this section is liberated from the full teaching work.

10. Economic Wells, Tidal Bunds and Bhal Tract Lands.

The undersigned visited the concrete wells under construction in some parts of Gujarat and the information is computed.

The Bhal tract was visited and several places inspected and the undersigned had discussion about the measures etc. with the local men.

III. Advisory and Propaganda.

The following work was attended to in the districts —

I. North Central Division.

(*i*) *Chimthana.*—The Bunding and other anti-erosion works carried out round about Chimthana in the Sindkheda Taluka, West Khandesh District, were visited and suggestions were offered where necessary.

(*ii*) *Bhusaval and Jamner.*—The anti-erosion works carried out between Bhusaval, Jamner and Jalgaon were inspected and suggestion and advice for the works were offered where necessary.

(*iii*) *Bhadgaon Farm.*—Contour levelling was carried out for an area of about 30 acres plot on the Bhadgaon Farm and plans were supplied by this section. Fly levels for the remaining area were taken at the points shown by the Superintendent of the farm and plans supplied.

(*iv*) *Yeola.*—Bunding and anti-erosion works carried out near Yeola were inspected and advice offered where necessary.

II. Bombay Suburban District.

(*i*) *Devnar.*—Survey of a field of Mr. Ali and fly levels of the area at Devnar near Chembur for terracing and irrigation layout was carried out and plans provided to him.

(*ii*) *Ambarnath.*—Investigation into the possibilities of the layout for a project of a bandhara and diversion channel for irrigation and also contour survey for bunding of an area of about 200 acres of Varkas land near Ambarnath was suggested by the Deputy Director of Agriculture, N. C. D., Nasik. Part of the survey has been carried out. The scheme is yet on hand.

III. Poona District.

(*i*) Advice for land development in the fields at Pashan was offered after carrying out the necessary survey. The plans are on hand.

(*ii*) *Talegaon Dhamdhere.*—The soaking compartments and bunding work carried out by Sadhu Mali were visited and suggestions offered where necessary.

IV. Gujarat.

(*i*) *Chaloda.*—An application was received from some cultivators of the place for the utilisation of the tail waters from the waste channel from the Bore-hold at Chaloda. The sites were visited and the matter is under investigation pending the results of the soil and water analysis etc.

(*ii*) *Dholka and Dhandhuka.*—The villages round Dholka and Dhandhuka were visited for investigation into the possibilties of bunding.

(*iii*) *Ahmedabad.*—A large number of wells with concrete walls have been constructed in the villages round about Ahmedabad and in the Ahmedabad District. These were visited and the cost economics ascertained.

(*iv*) *Surat Sewage Scheme.*—The Deputy Director of Agriculture, N. D., Gujarat, referred the question of sewage disposal of Surat and the necessary information was supplied to him.

V. Southern Division.

(*i*) *Dharwar.*—Dharwar farm and Land Development schemes executed at Marewar fields, Arlikatti fields and the Scheme under execution at Yekundi were visited and suggestions were offered where necessary.

VI. Anti-Erosion Training Class.

At the invitation of the Deputy Director of Agriculture, North Central Division, the Lecturer in Agricultural Engineering, Physics and Mathematics, was deputed to train the North Central Divisional staff in anti-erosion works at Yeola in March.

J. P. TRIVEDI,
Professor of Agricultural Engineering,
Physics and Mathematics.
COLLEGE OF AGRICULTURE,
Poona, 16th July 1937.

Programme of Work under the Professor of Agricultural Engineering, Physics and Mathematics for the year 1937-38.

The following work will be taken up during the year :—

(1) Further observations on the Erosion Observation plots near the College.

(2) Observations in the Katraj valley.

(3) Diva Ghat Forest area observations.

(4) Observations in the Pashan Valley Terraces.

(5) Observations in the Karjat Rice Terraces.

(6) Observations of Erosion in Gullys in deep soils, heavy and light soils at Gujarat Rivers as time permits.

(7) Erosion and silting observation on district stations if possible.

(8) Advisory work in the Districts.

(9) Visits to various schemes and places for observations.

(10) Preparation of a Bulletin on Soil Erosion and Land Development.

(11) Studying the question of protective and tidal bunds and Bhal tract land.

J. P. TRIVEDI,
Professor of Agricultural Engineering,
Physics and Mathematics.

COLLEGE OF AGRICULTURE,
Poona, 16th July 1937.

APPENDIX R.

Summary of Work done under the Professor of Entomology, College of Agriculture, Poona, during the year 1936–37.

Administration.

During the year under report I was in charge of this Section of Entomology except for a period of two months and twelve days from January 14th to 26th March, when I was on leave. During the leave period Dr. V. G. Deshpande, Lecturer in Entomology, acted for me and Mr. D. R. Panse, B.Ag., was taken up to act as Lecturer in Entomology in place of Dr. Deshpande. There was no other change in the staff.

Work.

The work done by this section is of 4 kinds :—

I. Teaching.

II. Investigations on important insect pests.

III. Advisory work.

IV. Service to the Public.

I. Teaching.

This was the third year of the introduction of the new Course of the B.Sc. (Agri.). So there was the subject of Entomology to be taught for the final year and Zoology for the first year. In the Post-graduate Course there is one student working at the investigation and Researches on Cotton boll worms.

II. Investigation Work.

Investigations were carried on, on the following pests :—

(1) Chillie Thrips (Scirtothrips dorsalis).

(2) Control of Cabbage Aphis (Siphocoryne indobrassicæ).

(2*a*) Control of Pea Aphis (Macrosiphum pisi).

(3) Jassids on Fig (Typhlocyba sp.).

(4) Betelvine bug (Disphinctus mæsarum Kirk).

(5) Citrus scale insects (Chrysomphalus aonidum).

(6) Lang pod borer (Heliothis obsoleta).

(7) Fruit flies (Chætodacus sp.).

(1) *Chillie Thrips.*—The problem under investigation was—

(*i*) To raise Virus free thrips in the laboratory.

(*ii*) To introduce Virus free thrips on batches of—

(*a*) healthy and (*b*) diseased plants, of which the latter were to be freed from thrips by spraying with Nicotine sulphate. Then the thrips should be allowed to feed on (*b*) group of diseased plants for a varying length of time and then transferred to another set of (*c*) healthy plants and the result to be noted.

(*iii*) The experiment to be conducted at three different periods during the year (monsoon and winter).

Virus free thrips were reared in the laboratory. They were allowed to feed on a diseased plant which was made free from thrips by spraying. Then they were transferred to a healthy plant. No mottling and curling was observed on the leaves fed upon by these thrips, indicating thereby that no virus was picked up and carried by them. The work is discontinued now.

(2) *Control of Cabbage Aphis.*—The home-made nicotine spray or the tobacco "Dhus" extract was found to be very effective in controlling aphis on cabbage. The Sub-committee of the Cresco for the pests and diseases felt that this experiment should be conducted for at least three seasons before a final programme of treatment could be recommended.

The treatment was to be in two parts—(*i*) Seed bed treatment and (*ii*) field treatment.

Seed-beds as well as the transplanted plots were to receive sprayings, seed-bed treatment for prevention and checking the initial infection and the field treatment to determine the interval between two sprayings and also the maximum number of sprayings for a complete kill irrespective of cost. The experiments were to be done at Mahableshwar. The place for experiments was suggested on the belief that small suitable plots would be available but the situation on actual experience was found to be unsatisfactory owing to spraying difficulties and unwillingness on the part of plot-owners.

As regards the seed-bed treatment, it could not be given as the plot-owners were not willing to give their plots for spraying. There was intense cold at that time and the plot owners feared that spraying would adversely affect the tender seedlings.

As for the second part of the treatment, some plots were taken and were differently treated. Some were sprayed once, some twice and some were given three sprayings. Some plots were left unsprayed as control.

It has been observed that re-infestation does take place from the neighbouring plots but if continuously three sprayings are given the crop becomes practically free from Aphis.

It is seen from the counts taken of living and dead aphis that the maximum kill percentage has not gone beyond 90 per cent. and the lowest is about 69 per cent. The reasons of the low percentage is that when a plot is sprayed very forcibly, many of the insects are thrown down to the soil and secondly owing to the effect of the extract, many of the aphis are killed and the dead aphis fall off from the leaves ; thus the number present on the leaves at the time of counting after 24 hours becomes less and very naturally the kill percentage goes down. Whereas when a leaf, is dipped in the extract, and is kept in a glass cell for observation, all the dead and live insects are there and the percentage of kill has never gone below 95 per cent.

To get the final result and to see the condition of the sprayed plots a visit was paid on the 9th of April 1937 and the eye examination showed that in the sprayed plots the number of Aphis was far less and many heads were practically free from Aphis, in plots which received three sprayings. The number of aphis was comparatively more in plots which received two sprayings and the plots which were sprayed only once were the most affected. To get a clear idea, one hundred heads were taken from each of the differently treated plots and the number of heads slightly infested or practically free, more infested and most infested was determined. Most infested leaves showed thick colonies of Aphis all over the surface. The next grade showed a patch here and a patch there and those which were practically free were put in the first category.

Table I.

Sprayed or unsprayed.	Not affected percentage.	Slightly affected percentage.	Most affected percentage.
Unsprayed	16·9	54·2	29·9
Once sprayed	23·0	39·5	37·5
Twice sprayed	58·7	16·4	26·9
Thrice sprayed	99·25	0	·75

It will be clearly seen from the above figures that in a plot, where three thorough sprayings are given, plants are practically free while in plots receiving less number of sprayings the plants show infestation very vividly. As regards the out-turn it was not available, as the plot-owners do not harvest the plots at one and the same time.

Conclusions.

(1) Mahableshwar area is not a suitable situation for trying these experiments, being inconvenient from every point of view.

(2) Though Aphis is present on the crop, the cultivators do not consider it is a serious pest.

(3) It is admitted on all hands that Dhus extract does kill Aphis, and three sprayings are necessary for complete kill.

(4) One objection is raised against Dhus is that some kind of yellow colour persists on outer leaves, which spoil—as they say— the appearance of the plot. However on no account the inner head is spoiled.

The programme laid down last year should be followed at some other place easily approachable and where there is surety of getting the outturn figures.

(2*a*) *Pea Aphis* (Macrosiphum pisi).—It was the intention to spray plots of peas at Mahableshwar infested with Aphis with Dhus extract and for that purpose Mahableshwar was visited on the 15th of October 1936. It was observed that peas were planted and just being infested with Aphis. One spraying therefore was given on 20th October 1936 to two plots. Afterwards owing to rains no further spraying could be given. On inquiry it is learnt that the sprayed plots has less number of Aphis than unsprayed one. No outturn was available, and hence only qualitative result was obtained.

(3) *Jassids on Fig* (Typhlocyba Sp.).—The incidence of hoppers was very small this year and there was hardly any necessity felt for spraying any garden to control the hoppers. Besides, this year being a very dry year the gardens suffered from drought. However one garden was given a preventive spraying of Fish oil Resin soap early in the month of November.

(4) *Betelvine bug* (Disphinctus mæsarum Kirk).—Practically no work has been done on the pest during the year under report. Owing to shortage of rain, there was dearth of water and the plantations were any how maintained by the owners with great difficulty by economising the water that was available in the wells. The soil in the Pan-malas was dry and there was less growth of the vines. The attack of the pest was very little. This may be attributed mainly to the absence of the wetness which is very congenial to the growth and breeding of these bugs. This also indirectly proves the value of sanitary conditions in a Pan garden. An attempt of trying different manurial treatments to the vines was made, but owing to famine conditions, the experiment was inconclusive.

(5) *Citrus scale* (Chrysomphalus aonidum).—The correspndence with the Firm (Messrs. Havero Trading Co., Bombay) is over. The information regarding fumigation is as follows :—

1. A fumigation sail to cover a tree 33′×33′ size would cost about Rs. 200.
2. The cost of the material depends on the size of the tree. Three briquettes (one briquette=10 Gms. of HCN) will fumigate a fairly large tree. One briquette costs just over one anna.
3. Amount of work :—Fumigation normally starts at sunset and continues until the sails start getting damp from dew which takes place in the early morning. The tree is exposed for half an hour to gas, allowing 5 minutes to remove the sail from one tree and spreading it over the next, it is seen that one tree can be fumigated every 35 minutes. This is about the minimum time with which a hundred per cent. kill can be obtained.

A requisition was made to the Director of Agriculture, Bombay Presidency, Poona, for permission to purchase a tent, and the reply has been received that the proposal should be submitted next year. Accordingly a proposal will be submitted.

(6) *Lang Pod Borer* (Heliothis obsoleta).—Gram pod borer (Heliothis obsoleta) has been determined as the borer in the Lang crop in the Broach District. The specimens of the caterpillars have been reared during the year under report and the statement has been confirmed.

By visiting the plots of Lang, three samples from three different places, which were reported to be infested, were brought and the percentage of infestation from the pods was found out. It was as follows :—

Sample No.	Total number of Pods.	Affected.	Unaffected.	Percentage of infestation.
1 ..	621	43	573	7·72
2 ..	1,043	25	1,018	2·39
3 ..	1,519	69	1,450	4·34
				14·45

From this it is seen that average attack was 4·81 per cent. and the maximum was 7·72 per cent.

It was reported at Broach that the attack of the borer was less this year.

It was also ascertained from the people that the Lang Pod Borer ordinarily does not attack Cotton, but it may attack it when the pest is bad.

(7) *Control of fruit flies*—The fruit flies are a serious pest of fruits. In certain years the loss due to this pest is great. The trouble of fruit flies to mango has been reported from Belgaum and Dharwar and that to guava in Ganeshkhind Fruit Experimental Station, Kirkee. The Horticulturist to Government, Bombay Presidency, Poona, has requested the Professor of Entomology to include in his programme of work this item of fruit flies for investigation. Hence in March 1937 in the mango season this was taken up. The control of fruit flies consists in the destruction of flies by two methods :—(1) trapping and (2) poison baiting. It is the first method that is being tried at present. Trapping is done by catching flies by attracting them to a lure. This material (lure) " Clensel A" has been found to be successful in attracting both males and females on mango and other fruits from the trials carried on during January to March 1937, it is seen that the number of females is more than the males, the proportion being 4 females to 3 males. The trials with the trapping of mango fruit flies are being done at Poona, Ratnagiri, Pardi (District Surat) and Belgaum.

III. Advisory and Educational Work.

During this year about 317 inquiries received and these were attended to by correspondence and actual visits by the Professor and the Lecturer. The following figures will show the nature of inquiries received during the year.

The classification of the inquiries is as under :—

Apiculture	18
Apparatus and Chemicals	15
Duster and sprayers	11
Betelvine Bug	9
Phytopathological Certificates	71
Control of White Ants	16
Grasshoppers	7
Pests of Cereals	39
Pests of Fruits	65
Pests of Vegetable	40
Pest of Sugarcane	7
Pests of Oil seeds	3
Lac	5
Silk	6
Scientific names	5

The Professor of Entomology toured for 41 days and visited 32 places for advisory and investigational work. The Lecturer toured for about 32 days and visited 19 places. The Lecturer gave lectures to Co-operative Class, Refresher's Class (Educational Department), and the Horticultural Classes in Vernacular in the Konkan and Khandesh.

IV. Service to the Public.

Some Institutions and Agricultural Officers were supplied with Insect Show cases, Silk Worms, and Cochineal Insects. The materials sent to me for trial and opinion, were tried and the opinions communicated to the respective firms.

During the year under report the following insecticides were tried and the results are tabulated below :—

	Name of the Insecticide.	Insects and pests against which it was tried.	Results.
1.	Cirrus sulphur ..	Mango hoppers ..	Mango hoppers are controlled, but a slight withering of shoots was noticed.
2.	Grease Banding material.	Ants on Babul, Mango, Sesbania.	It was effective for a period of 3 weeks, if once applied.
3.	Mysore Insecticidal Soap.	Cabbage aphis ..	Kill percentage varies from 90 to 95%.
4.	Keral Fish Oil Soap.	Do. ..	Kill percentage varies from various from 93 to 97%.
5.	Dhus extract ..	Do. ..	Kill percentage 95%.
6.	Whiz ..	Do. ..	Kill percentage 98·4%.
7.	Wood-guard ..	White Ants ..	Trial not conclusive.
8.	Swoop ..	Cockroach and Bed-bugs.	More effective against Cockroaches.

There was a great trouble of White Ants on the Poona Golf Course and I was requested to destroy the nests of White Ants on that area. The funds being provided for by the Club, the work was taken up. There were about 373 nests and all were treated by petrol. Practically all of them have been destroyed.

Lastly I would like to remark that all the members of the staff worked satisfactorily. The correspondence and other office work has increased considerably. This section was created as an independent section in 1934 and no provision of a clerk was made on the assumption that the section would be able to cope with the work. The Agricultural Sub-Overseer has been put on to this work in addition to other duties which an Agricultural Sub-Overseer is expected to do. Hence a necessity for a special clerk is felt.

T. N. JHAVERI,
Professor of Entomology, Poona.

PUBLICATIONS.

(1) DESHPANDE, V. G.—Some observations on the biology of Aleurodidæ, Bombay Natural History Society, Bombay, XXXIV No. I, pp. 190-193.

(2) DESHPANDE, V. G.—Control of Cabbage aphis (Siphocoryne indobrassicæ)—(under print).

(3) DESHPANDE, V. G.—Preliminary account of the Aphididæ of Poona (under print).

The last two articles have been sent to the Agriculture and Live Stock, New Delhi, and the Bombay Natural History Society, respectively, for publication.

T. N. JHAVERI,
Professor of Entomology,
College of Agriculture, Poona.

Programme of Work under the Professor of Entomology, College of Agriculture, Poona, for the year 1937-38.

(1) Control of Cabbage Aphis.

The investigations carried on at Mahableshwar could not be supervised and conducted from Poona on the lines proposed by the Committee. Hence the conclusions arrived at will have to be confirmed. The programme proposed by the Committee will therefore be carried out at some other place (Ganeshkhind Fruit Experiment, Kirkee), where supervision is possible and the outturn is available. Only qualitative results are not enough.

(2) Control of Pea Aphis.

Systematic trials of Dhus extract could not be done at Mahableshwar. Hence some other area will have to be selected, and the trials to be done there.

(3) Jassids on Fig.

It is not yet determined if the leaf hoppers or the rust is the real trouble. These hoppers are found on the plants only here and there and in gardens which are clean and well kept, the number is negligible. If the cultivators are asked, none has ever said that the garden suffers from the hoppers. So spraying trials will be stopped.

(4) Betelvine Bug.

A scheme for the investigation of this pest has been sanctioned under the Sir Sassoon David Trust Fund from the year 1937 for four years. So systematic investigation will be taken up.

(1) Survey of the pest in the Betelvine tract.

(2) Study of the Bionomics of the pest.

(5) Citrus Scale Insects.

Control of this pest by fumigation has to be undertaken and if the money required for these experiments is available, arrangement will be made to start them. The suitable place and area to be taken will be determined in consultation with the Horticulturist to Government, Bombay Presidency, Poona.

(6) Lang Pod Borer.

The pest under investigation is the polyphagous gram pod-borer which has got about 25 different host plants, and the question that is to be considered is the control of this pest. The estimate of loss due to this borer will have to be determined in years of bad attack and the control measures to be devised according to the exigencies of the occasion and the situation. If the attack is less than 10 per cent., the control may not be taken up.

(7) Control of Fruit Flies.

The trials with the lure (Clensel) will be continued for one year. The seasonal catches will indicate the flies prevalent in particular months and particular fruits. Side by side with the trials with this lure, poison baiting will be undertaken. The material for poisoning will be sodium fluosilicate.

College of Agriculture,
Poona, 22nd July 1937.

T. N. JHAVERI,
Professor of Entomology, Poona.

List of Agricultural Bulletins published by the Department of Agriculture and kept for Sale at the Government Book Depôt, Bombay.

No.	Year.	*Subject.*	Price. Rs. a. p.
32	1908	Locusts in India, by H. M. Lefroy, Imperial Entomologist, Pusa.	0 8 0
33	1909	Cultivation of Broach Cotton in Dharwar, by M. L. Kulkarni, Divisional Inspector of Agriculture, S. D.	0 4 0
34	1909	Night-soil—A Valuable Manure, by G. K. Kelkar, Assistant Professor of Agriculture, Agricultural College, Poona ...	0 4 0
36	1910	First Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency, by W. Burns, Economic Botanist ...	0 14 0
37	1910	An Examination of the Seed-Supply of the Broach District, by G. D. Mehta	0 4 0
39	1910	The Salt Lands of the Nira Valley, by Harold H. Mann, Principal, Agricultural College, Poona, and V. A. Tamhane, Laboratory Assistant, Agricultural College, Poona... ...	0 5 0
40	1911	The Cultivation of Guavas near Poona, Dharwar and Limbgaon .	0 12 0
41	1911	Groundnuts in the Bombay Deccan	0 4 0
43	1911	An Examination of the Seed-Supply of the Broach District, Part II	0 5 0
44	1911	Preliminary Study of the Red Rot of Sugarcane in the Bombay Presidency	0 8 0
45	1911	Second Year's Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency	0 14 0
46	1911	Seed Selections Series I, Broach Cotton	0 8 0
47	1911	San Hemp	0 4 0
48	1911	Poona Furnace	0 7 0
„	1911	Do. (Marathi)	0 6 0
49	1911	An Examination of the Seed-Supply of the Ahmednagar District, Part I	0 5 0
50	1912	An Examination of the Seed-Supply of the Ahmednagar District, Part II	0 3 0
51	1912	Third Year's Experiments in the Treatment of Grape-Vine Mildew	0 3 0
52	1912	Muscovado Sugar Machinery and its scope for Gul Manufacture in India	0 8 0
53	1912	A Method of improving the Quality of Cotton Seed	0 7 0
55	1913	An Examination of the Seed-Supply of the Poona District ..	0 3 0
57	1913	Improvement of the Indigenous Plough of Western India ...	0 12 0
59	1914	Common Salt and its use as Manure in the Konkan Division ...	0 3 0
62	1914	The Value of Castration of Deccan Bullocks	0 3 0
63	1914	Substitutes for Rab	0 3 0
64	1914	Alkali or Kalar Experiments and Completion Report of Daulatpur Reclamation Station in Sind	0 14 0
65	1914	A List of Diseases of Economic Plants occurring in the Bombay Presidency	0 4 0
67	1914	An Examination of the Seed-Supply of the Sholapur District ...	0 3 0
69	1915	The Rice Stem Borer in the Konkan	0 3 6
70	1915	Improvement of Cotton in the Bombay Presidency (except Sind).	0 3 6
74	1915	Well Waters from the Trap Area of Western India	0 6 0

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No.	Year.	*Subject.*	Price. Rs. a. p.
79	1916	The Cultivation of Guavas in Gujarat	0 5 6
80	1916	List of Seeds available on the Agricultural College Farm, Poona .	0 5 3
81	1916	Note on Fencing Construction	0 6 9
82	1916	Cultivation of drilled Paddy in South Bombay Presidency ...	0 8 0
83	1917	The Spice Gardens of Sirsi in Kanara	0 10 6
84	1917	Seed Selection Series—Kumpta Cotton	0 1 0
85	1917	Note on Cattle in the Bombay Presidency	0 11 0
86	1917	Establishment and Management of the Dairy Farm ...	0 7 0
87	1918	The Utilisation of Inferior Grass Herbage, Experiments at the Tegur Cattle Farm	0 9 0
88	1918	First Report on Fruit Culture as practised round about Tharushah (Sind) in Nawabshah District	0 2 0
90	1918	Work on the Manjri Farms for the years 1915-18	0 7 3
91	1919	The Cultivation of Berseem in Sind—Experiments at Sukkur ...	0 1 0
92	1919	Classification and Description of the Jowars of the Bombay-Karnatak	0 10 3
93	1919	Palm Gul Manufacture in the Bombay Presidency (principally Date Palm)	1 3 9
94	1919	The Sugarcane Borer and its Control	0 4 3
96	1920	Investigations into the nature of the Salt Lands of Sind ...	0 12 0
97	1920	Prickly-Pear as a Cattle Food	1 4 0
98	1920	Fruit Culture as practised near Shikarpur, Sind	0 1 6
99	1920	Rice Cultivation in the Larkana District, Sind	0 8 0
100	1920	Fodder Crops of Western India	2 1 0
101	1920	Fruit Culture in Palitana and Jamnagar	0 8 6
102	1920	Investigations on Potato Cultivation in Western India ...	1 15 0
103	1920	The Book of the Mango	3 5 0
		Do. do. (Marathi).	
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